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SECTION I
GENERAL INFORMATION

1.1 INTRODUCTION

This manual contains information about the physical, mechanical, and electrical characteristics of the BK Radio DMH APCO Project 25 digital radios.

1.2 DESCRIPTION

The DMH APCO Project 25 digital radios are self-contained VHF FM Radios covering the frequency range of 136MHz to 174MHz. The radios are multi-channel and digitally synthesized using a single crystal for frequency control. All models incorporate an EEPROM for the storage of data such as channel frequencies, channel guards, channel labels, and digital data. The DMH features an alphanumeric eight-character vacuum fluorescent display, allowing the channels to be named for easy user recognition.

An arrow on the vacuum fluorescent display points to each front-mounted push button that is active. The five push buttons can be programmed with the following functions:

Standard Functions		Optional Functions			
MON	Monitor Squelch Noise	**TA**	Repeater Talk Around	**GSC**	Group Scan
SCN	Channel Scan	**CG**	Channel Disable	**SQL**	Squelch Adjust
PRI	Priority Scan	**HOM**	Home Channel	**SEC**	Transmit Secure Mode
PA	Public Address	**SPK**	Remote Speaker	**ACC**	Accessory 1
GRP	Group Select	**NXT**	Next Scan Channel	**ACC**	Accessory 2
TXD	Transmit Digital Mode	**LPW**	Low Power Select	**ACC**	Accessory 3

The microphone connector provides an RS-232 interface for control by a keypad microphone, and for dealer programming of alphanumeric labels, push button functions, channel frequencies, and Dual Tone Multiple Frequency/Automatic Numeric Identifier (DTMF/ANI) encode information.

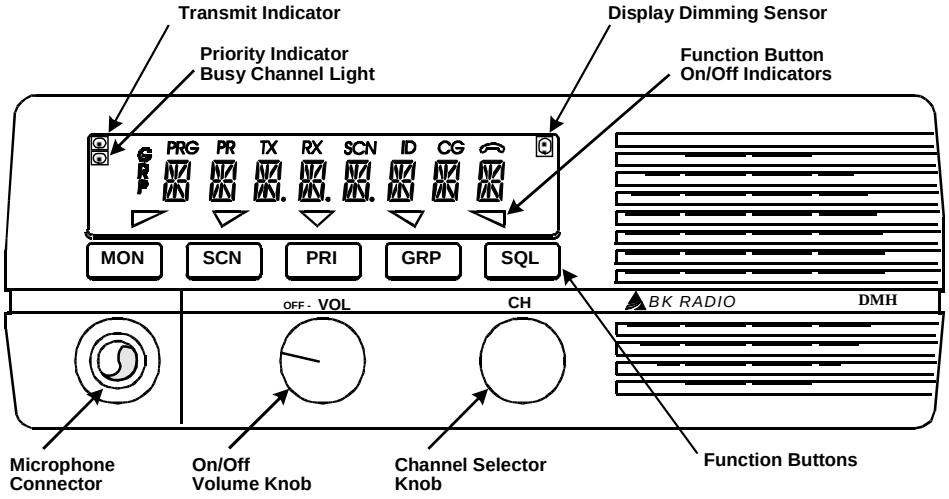


Figure 1-1 CONTROLS

1.3 TECHNICAL CHARACTERISTICS

FREQUENCY RANGE	136-174 MHz
CHANNELS:	400 (25 groups of 16 channels)
OPERATING VOLTAGE	13.6 Vdc Negative ground

OPERATIONAL FEATURES:

Programmable Push Buttons	Per Channel Analog/Digital/Mixed-Mode, RX and TX
Dual Priority Scan	Frequency Display
Transmit Time-Out Timer	User Selectable Scan
Scan Delay	Busy Channel Indicate / Lockout
Tone Channel Guard (CTCSS)	DTMF/ANI Encode
Digital Channel Guard (CDCSS)	Interstitial Frequency Capability
Nuisance Channel Delete	TalkBack Scan

PRIMARY POWER INPUT

Receive @13.8V	1.0 Amperes
Transmit @ 13.6V	14.0 Amperes
Standby @ 13.8V	0.5 Amperes

OPERATING TEMPERATURE:	-30° to +60° C

PHYSICAL DIMENSIONS

Width	6 in.
Depth	9.38 in.
Height	2.12 in.
Weight	5 lbs.

FREQUENCY STABILITY	±2.5 PPM
CHANNEL SPACING	15/30 and 12.5/25 kHz
CHANNEL INCREMENTS	5.0/6.25/7.5 kHz
ANTENNA CONNECTOR	MINI UHF
FCC IDENTIFICATION NUMBER:	K95DMH599

TRANSMITTER

	25 / 30 kHz	12.5 / 15 kHz
RF OUTPUT POWER:	15 to 50 Watts	15 to 50 Watts
OPERATING FREQUENCY SPREAD:	38 MHz	38 MHz
SPURIOUS AND HARMONICS:	80 dB	80 dB
MODULATION DEVIATION:	5 kHz	2.5 kHz
FM HUM AND NOISE:	50 dB	45 dB
FREQUENCY STABILITY:	±2.5 PPM	±2.5 PPM
AUDIO DISTORTION:	3%	3%
AUDIO RESPONSE (per EIA):	+1 dB / -3 dB	+1 dB / -3 dB
MODULATION CHARACTERISTICS:	16K0F3E	11K0F3E 8K10F1E 8K10F1D

RECEIVER

	25 / 30 kHz	12.5 / 15 kHz
SENSITIVITY: 12dB SINAD	0.28µV	0.28µV
FREQUENCY SPREAD:	38 MHz	38 MHz
SELECTIVITY:	75 dB	70 dB
IMAGE AND SPURIOUS RESPONSES:	80 dB	80 dB
INTERMODULATION:	75 dB	75 dB
AUDIO RESPONSE (per EIA):	+1 dB / -3 dB	+1 dB / -3 dB
AUDIO OUTPUT (@ 5% Dist.):	5/10 Watts	5/10 Watts
HUM AND NOISE	50 dB	45 dB
AUDIO FREQUENCY LOAD (5/10 Watts)	16/8 Ohms	16/8 Ohms
INPUT IMPEDANCE	50 Ohms	50 Ohms

1.4 ACCESSORIES

Use only BK Radio approved, supplied, or replacement accessories. Use of non-BK Radio approved accessories may exceed the FCC RF exposure guidelines. For a list of BK Radio approved accessories visit the following website: *http://www.relm.com*

1.5 LICENSE REQUIREMENTS

This equipment must be licensed by the Federal Communications Commission (FCC) before it may be used. Your BK Radio dealer can assist you in filing the appropriate application for the FCC, and will program each radio with your authorized frequencies and signaling codes.

1.6 SERVICE INFORMATION

If you need service, contact your local BK Radio dealer equipped to service your radio. If you find it impractical to have service performed by your local dealer, contact BK Radio at the address below:

BK Radio
ATTN: Customer Service
7100 Technology Drive
West Melbourne, FL 32904
Voice (800) 422-6281
FAX (321) 953-7986

SECTION II
INSTALLATION AND PROGRAMMING

2.1 GENERAL INFORMATION

This section contains information concerning the installation and programming of the BK Radio DMH APCO Project 25 digital radios.

2.1.1 UNPACKING AND INSPECTING EQUIPMENT

Exercise extreme care when unpacking the equipment. Make a visual inspection of the unit for evidence of damage incurred during shipment. If a claim for damage is to be made, save the shipping container to substantiate the claim. The claim should be promptly filed with the transportation company. It would be advisable to retain the container and packaging material after all equipment has been removed in the event that equipment storage or reshipment should become necessary.

2.1.2 INSTALLATION

Plan your installation carefully. Locate the radio and microphone within easy reach, giving the operator a clear view of the display. Do not locate the radio or microphone in a position that interferes with safe operation of the vehicle.

Once the equipment location is chosen, determine the best routing for cables and wires to connect the system. Use a rubber grommet to protect the wires when passing through sheet metal. Avoid any route that subjects the wire to pinching, cutting, or high heat from the engine or other vehicle component.

Dash Mount

The radio must be used with a 12 volt, NEGATIVE GROUND electrical system. Refer to Figure 2-1.

1. Crimp a fuse holder in line with the red power lead as close to the battery as possible.

2. Connect the red power lead to the vehicle battery POSITIVE terminal. Using other positive voltage points in the vehicle is not recommended.

3. Connect the black lead to a good ground point on the vehicle chassis. Connection to the negative battery terminal is not recommended.

4. Crimp a fuse holder in line with the yellow ignition wire.

5. Connect the yellow ignition lead to an ignition switch source. If the radio needs to be always powered, connect the yellow lead to the red power lead.

6. Mount the antenna carefully. Follow the instructions supplied with the antenna kit. Route the coax cable to the radio mounting location.

7. Fasten the radio mounting bracket securely to the desired location.

8. Mount the microphone hanger clip securely to the desired location. The microphone hanger clip must be grounded for proper radio operation. Use the supplied ground wire if needed.

9. Mount any approved accessory speakers and route the wires to the rear of the radio bracket.

10. Connect the power lead, antenna connector, and accessory wires to the rear of the radio.

11. Place the radio in the mounting bracket, adjust to the proper mounting angle, and thread in the two side mounting knobs until the unit is secure.

NOTE: Option A and B connections are logic level outputs. Consult your BK Radio dealer before connecting accessories to these pins.

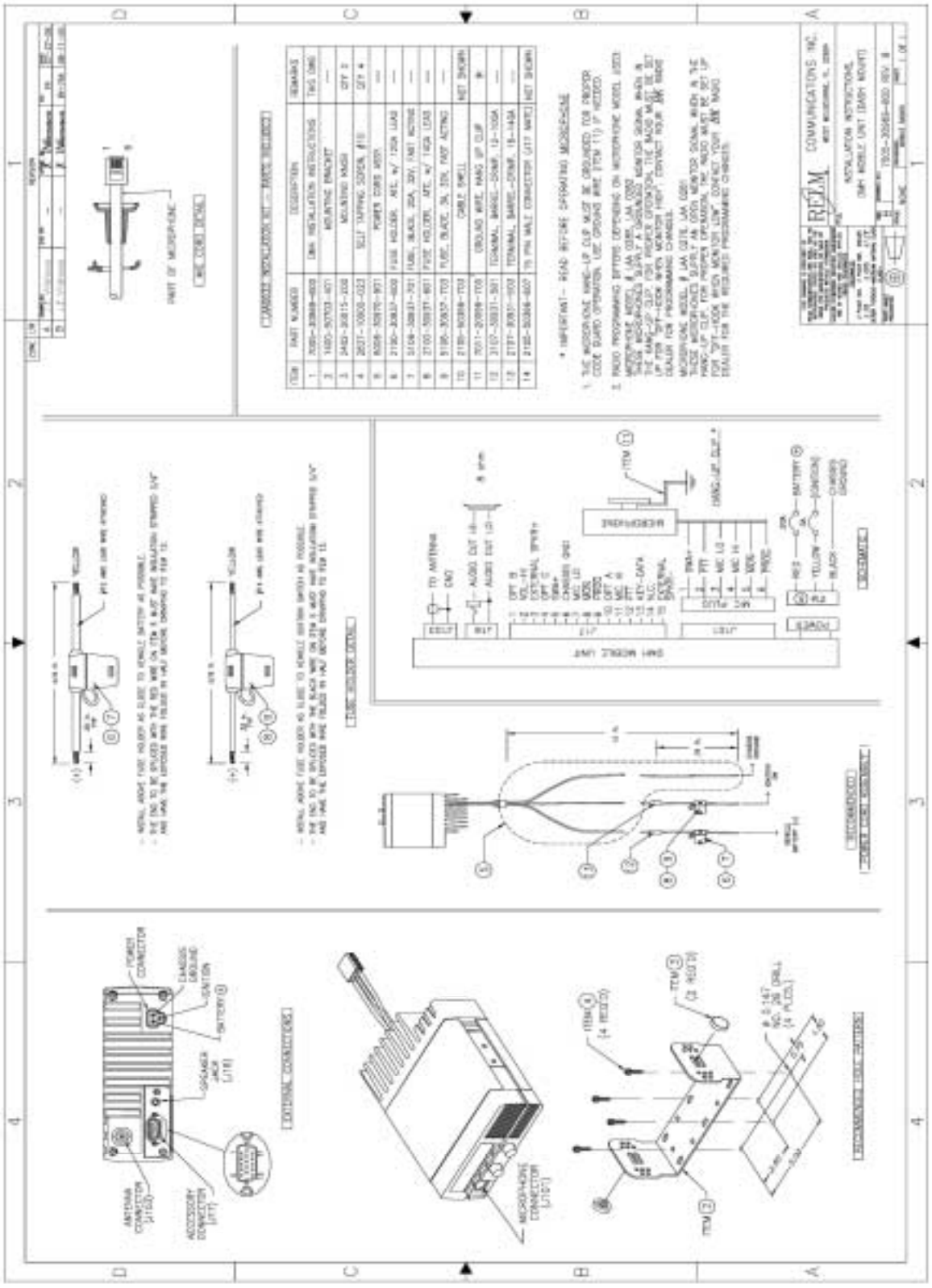


Figure 2-1 Installation – Dash Mount

2.2 PROGRAMMING

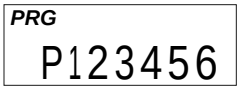
There are three different ways to program BK Radio radios:

- **BY PROGRAMMING MICROPHONE** A radio can be programmed with the optional LAA 290 programming microphone. That procedure is described in this section.
- **BY CLONING** You can transfer the programmed settings to another radio of the same frequency band by using a cloning cable. See "Cloning Radio Settings" in section 2.3 of this manual.
- **BY COMPUTER** With a computer, DMH programming software LAA 0745, and an LAA 0725 interface cable. That procedure is not described in this manual. Contact BK Radio for the required programming cable and software.
- **BY KEY FILL DEVICE** Radios that have been optionally configured for encryption must have encryption keys loaded with an APCO Project 25 compatible key fill device such as the Motorola KVL 3000 Plus. The radio can hold up to 32 DES or AES keys.

2.2.1 MICROPHONE PROGRAMMING

1. Select a channel group to be programmed (if applicable) by pressing the GRP button and rotating the Channel Selector knob. Press the GRP button again to return to Channel Select mode.
2. Press and hold the far right pushbutton on the front of the radio.

3. While holding the far right pushbutton, press and hold the **[FCN]** key on the microphone. After about three seconds the display will show **- - - ID**.



4. Release the **[FCN]** key and the right pushbutton. The radio is now in the password entry mode.
5. Enter the six-digit password code for the selected group. Without the correct password code, you cannot proceed with programming.

   NOTE: New radios shipped from the factory are assigned the password code **000000**.

   While entering the password code the display will not change, but a beep will sound for each key pressed. If the password code is entered incorrectly, the radio will reset to normal operation. Try again, starting at Step 2 above.

6. Press the **[ENT]** key to proceed to programming mode. The display will change to **PRG CH 00**.

   NOTE: YOUR RADIO MAY HAVE BEEN SET UP TO BLOCK KEYPAD PROGRAMMING ACCESS TO SOME OR ALL VARIABLES. CONTACT YOUR BK RADIO DEALER IF YOU FEEL YOU NEED ACCESS TO THESE FIELDS.

2.2.2 GENERAL SETTINGS (CHANNEL 0)

Channel 0 settings for each group must be programmed separately.

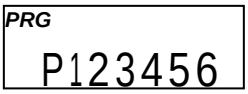
NOTE: Settings listed as Group One Functions, Group Two Functions, and Group Three Functions refer to programming function groups, not channel groups.

Press the **[FCN]** key repeatedly to view the settings in Channel 0 and then loop back to the **CH 00** entry point.

Channel 0 settings include:

- Group Password
- Automatic Numeric Identification (ANI)
- Transmitter Time-Out Timer
- Scan Delay Time
- Priority 1 Channel
- Priority 2 Channel
- Channel 0 Group One Functions: 1-12345
  - Reserved (Function 1)
  - Group Scan List (Function 2)
  - Transmit on Priority 1 (Function 3)
  - Priority 1 Lock (Function 4)
  - Scan List Lock (Function 5)
- Channel 0 Group Two Functions: 2-12345
  - User Channel Guard Selection (Function 1)
  - Busy Channel Operation (Functions 2 & 3)
  - ANI/DTMF Mode (Functions 4 & 5)
- Channel 0 Group Three Functions: 3-12345
  - Reserved (Functions 1 - 4)
  - Alphanumeric/Numeric Display Mode (Function 5)
- Group Label

2.2.2.1 GROUP PASSWORD

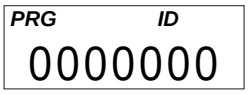


1. After entering Programming Mode the display will show '**PRG CH 00**.'
2. Press the **[FCN]** key.
3. The display will indicate the password for the selected group.

4a. If no change is needed for the group password, press the **[FCN]** key to advance to the next field.

4b. To enter a new password, press the **[CLR]** key, then enter a new six-digit password. Press the **[ENT]** key to store the new password and advance to the next field.

2.2.2.2 AUTOMATIC NUMERIC IDENTIFICATION (ANI)

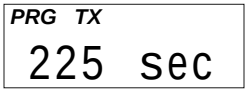


1. After the group password is set, the display will indicate the ANI ID number (as many as seven digits may be used). The ID number can be used for either radio management or transmitted as a DTMF tone burst for ANI purposes. The ANI can be enabled or disabled. See "ANI/DTMF Mode" in section 2.2.2.8.4 & 2.2.2.8.5 of this manual.

2a. If no change is needed for the ID number, press the **[FCN]** key to advance to the next field.

2b. To enter a new number, press the **[CLR]** key and then the number keys. The digits will appear at the right of display and move to the left. Press the **[ENT]** key to store the new ID number and advance to the next field.

2.2.2.3 TRANSMITTER TIME-OUT TIMER

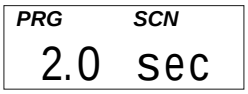


After the ID number is set, the display annunciators will indicate '**PRG TX**.' This is the duration of the transmitter Time-Out Timer. **0 SEC** means the Time-Out Timer is disabled.

Press the **[FCN]** key to advance to the next field if no change is needed.

1. Press the **[PRI]** key to increase the Time-Out Timer duration by 15 seconds, with a maximum of 225 seconds (3 minutes, 45 seconds). Press the **[PRI]** key again to change the duration from 225 seconds to zero.
2. Press the **[CLR]** key to set the Time-Out Timer duration to zero.
3. Press the **[ENT]** key to store the changed setting and advance to the next field.

2.2.2.4 SCAN DELAY TIME

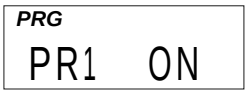


After the Time-Out Timer is set, the upper display will indicate '**PRG SCN**.' This is the Scan Delay time in seconds.

Press the **[FCN]** key to advance to the next field if no change is needed.

1. Press the **[PRI]** key to increase the scan delay time by .5 seconds, up to 7.5 seconds. Press the **[PRI]** key again to change the time from 7.5 seconds to 0.
2. Press the **[CLR]** key to reset the scan delay time to 0.
3. Press the **[ENT]** key to store the changed setting and advance to the next field.

2.2.2.5 PRIORITY 1 CHANNEL



After the Scan Delay is set, the display will indicate '**PRG PR1**.' The Priority 1 Channel can be programmed as a fixed channel, tied to the Channel Selector knob, or programmed OFF. If the radio is programmed to transmit on the Priority 1 Channel, transmissions will occur on PR1, if PR1 isn't programmed OFF, when operating in Single or Dual Priority Scan Mode.

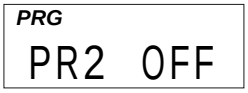
If PR1 is a fixed channel, and the **[PRI]** key on the keypad is not locked out, during normal radio operation the user can move the channel selector to a new channel and press the **[PRI]** key to choose a new PR1 channel.

1. Press the **[PRI]** key to cycle through the priority channel options, or enter a fixed priority channel using the number keys.

   Setting the channel to ON ties the PR1 channel to the Channel Selector knob. Pressing **[CLR]** or the **[0]** key turns the PR1 channel OFF.

2. Press the **[ENT]** key to store the new priority channel and advance to the next field.

2.2.2.6 PRIORITY 2 CHANNEL



After the Priority 1 Channel is set, the display will indicate '**PRG PR2**.' The Priority 2 Channel can be programmed as a fixed channel, tied to the Channel Selector knob, or programmed OFF.

The PR2 channel cannot be altered during normal radio operation.

1. Press the **[PRI]** key to cycle through the priority channel options, or enter a fixed priority channel using the number keys.

   Setting the channel to ON ties the PR2 channel to the Channel Selector knob. Pressing **[CLR]** or the **[0]** key turns the PR2 channel OFF.

2. Press the **[ENT]** key to store the new priority channel and advance to the next field.

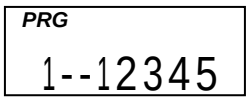
2.2.2.6.1 OLD-STYLE BK PRIORITY SCAN

The radio can be programmed to mimic the Old-Style BK Priority Scan Modes as follows:

Mode	PR1	TX on PR1	PR2
A	On	No	Off
B	Fixed Channel #	No	Off
C	Fixed Channel #	Yes	Off

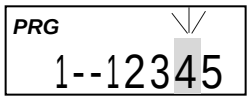
See "Priority Scan" in section 3.12 of this manual for operational details of the Old-Style BK Priority Scan Modes.

2.2.2.7 CHANNEL 0 GROUP ONE FUNCTIONS



After the Priority 2 Channel is set the display will show '**PRG 1-12345**.' This is a group of five individual functions that can be enabled or disabled.

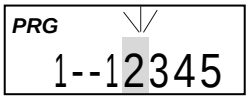
When a function is enabled, the corresponding number in the display will flash. When the function is disabled the number is steady. If you wish to change the function from enable to disable or vice versa, press the number key corresponding to that function.



EXAMPLE: If function 4 (Priority 1 Lock) is disabled, the 4 in the display will not be flashing. If the **[4]** key is pressed, the 4 in the display will flash, signifying that Priority 1 Lock is enabled. A subsequent press of the **[4]** key will disable Priority 1 Lock.

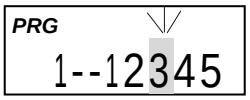
2.2.2.7.1 Function 1 is reserved.

2.2.2.7.2 GROUP SCAN LIST



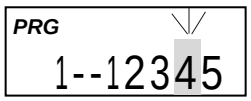
When function 2 is enabled (flashing) the current group will be scanned when the radio is operating in Group Scan Mode.

2.2.2.7.3 TRANSMIT ON PRIORITY 1



When function 3 is enabled (flashing) transmissions will occur on PR1, if PR1 isn't programmed OFF, when operating in Single or Dual Priority Scan Mode. To simulate BK Radio's Old-Style Priority Mode C, Transmit on Priority 1 must be enabled, with Priority 2 channel set to OFF.

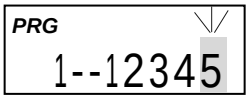
2.2.2.7.4 PRIORITY 1 LOCK



When function 4 is enabled (flashing) the **[PRI]** key is locked out in the Operating Mode. The user will not be able to change the designation of the Priority 1 Channel.

When function 4 is disabled (steady) the user will be able to change the channel that is designated as Priority 1 Channel. See "Dual Priority Scan" in section 3.12.1 of this manual.

2.2.2.7.5 SCAN LIST LOCK



When function 5 is enabled (flashing), the user will not be able to change the channels in the Scan List. When disabled (steady), the user can enter or delete channels from the Scan List. See "Change the Scan List" in section 3.11.6 of this manual.

2.2.2.7.6 STORE GROUP ONE SETTINGS

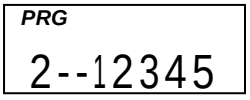
Once each function 1-5 is set as desired, you can store the changes, discard the changes, or disable all 5 functions.

Press the **[CLR]** key to disable all Group One functions (steady).

Press the **[ENT]** key to store new Group One settings into memory and advance to the next field.

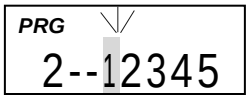
Press the **[FCN]** key to advance to the next field without saving changes.

2.2.2.8 CHANNEL 0 GROUP TWO FUNCTIONS



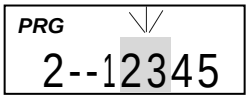
After Group One functions are set, the display will show '**PRG 2-12345**' for Group Two functions. As with Group One functions, the enabled function numbers will flash. The disabled functions remain steady.

2.2.2.8.1 USER CHANNEL GUARD SELECTION



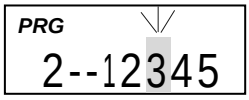
When function 1 is enabled (flashing) the user will be able to press the keypad to independently select the Channel Guard values that are programmed into Channels 1 through 16 while operating on any Channel 1 through 16. When function 1 is disabled the user will be unable to use the keypad for Channel Guard selection. See "User Selected Channel Guard" in section 3.15 of this manual.

2.2.2.8.2 & 2.2.2.8.3 BUSY CHANNEL OPERATION

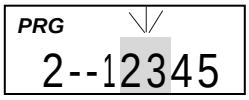


Functions two and three are used to set Busy Channel operation. There are three types of busy channel operation available. They are described more fully under "Busy Channel" in section 3.16.6 of this manual.

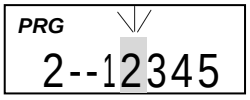
Busy Channel Modes include:



Busy Channel Indicator - The yellow LED illuminates when a signal is received on the channel selected, with or without the programmed receive Channel Guard setting.



Busy Channel Lockout - The yellow LED illuminates and the transmitter PTT is disabled when a signal is received without the programmed receive Channel Guard setting.

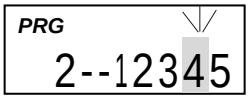


Busy Channel Override - This function is similar to Busy Channel Lockout except the transmitter PTT can be activated by pressing the **[CG]** button.

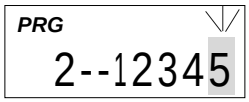
To set Busy Channel operation, use the following chart:

Busy Channel	Function 2	Function 3
Indication	Disable (Steady)	Enable (Flashing)
Lockout	Enable (Flashing)	Enable (Flashing)
Override	Enable (Flashing)	Disable (Steady)

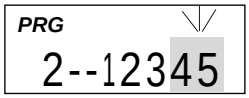
2.2.2.8.4 & 2.2.2.8.5 ANI/DTMF MODE



When function 4 is enabled (flashing) the ANI ID number will be transmitted (as a DTMF tone sequence) with each press of the PTT switch. See "Automatic Numeric Identification (ANI)" in section 2.2.2.2 of this manual for instructions on setting the ANI number.



When function 5 is enabled (flashing) the keypad becomes active for manual DTMF operation.



When functions 4 and 5 are both enabled (flashing) the ANI tone sequence will be transmitted only after the **[ENT]** key is pressed while the transmit PTT switch is activated. A sidetone of the ANI number transmitted will also be heard through the speaker.

2.2.2.8.6 STORE GROUP TWO SETTINGS

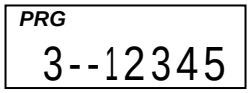
Once each function 1-5 is set as desired, you can store the changes, discard the changes, or disable all 5 functions.

Press the **[CLR]** key to disable all Group Two functions (steady).

Press the **[ENT]** key to store new Group Two settings into memory and advance to the next field.

Press the **[FCN]** key to advance to the next field without saving changes.

2.2.2.9 CHANNEL 0 GROUP THREE FUNCTIONS



After Group Two functions are set, the display will show '**PRG 3-12345**' for Group Three functions. As with Group One and Group Two functions, the enabled function numbers will flash. The disabled functions remain steady.

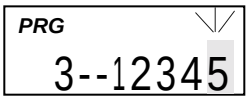
2.2.2.9.1 Function 1 is reserved for future enhancements.

2.2.2.9.2 Function 2 is reserved for future enhancements.

2.2.2.9.3 Function 3 is reserved for future enhancements.

2.2.2.9.4 Function 4 is reserved for future enhancements.

2.2.2.9.5 ALPHANUMERIC/NUMERIC DISPLAY MODE



When function 5 is enabled (flashing), the display operates in Alphanumeric Mode, enabling the display of channel labels. When disabled (steady), the display operates in Numeric Display Mode. This mode displays channel numbers instead of labels.

2.2.2.9.6 STORE GROUP THREE SETTINGS

Once each function 1-5 is set as desired, you can store the changes, discard the changes, or disable all 5 functions.

Press the **[CLR]** key to disable all Group Three functions (steady).

Press the **[ENT]** key to store new Group Three settings into memory and advance to the next field.

Press the **[FCN]** key to advance to the next field without saving changes.

2.2.2.10 GROUP LABELS

After the display mode, the display will show the current label for the channel group. Each channel group can have a label of up to eight characters or spaces. The characters can include **0-9, A-Z, -, *, $, /, +, %, \, |, _, <, >, h, or blank**.

If no change is needed, press the **[FCN]** key to go back to the starting point for Channel 0 settings.

Press the **[CLR]** key to erase the current label.

Press the **[CLR]** key a second time to restore the current label.

NOTE: Special software available from BK Radio lets you enter group labels and channel labels from a computer. Contact your dealer for information.

2.2.2.10.1 Changing The Group Label

Press the **[CLR]** key. The display becomes blank.

Press number keys to enter 0-9 in positions 1-7. The digits start in position 7, then move left.

Press the **[#]** key to toggle a decimal on or off to the right of the character in position 7. The decimal moves left with the number in position 7 as new numbers are entered.

Use the following steps to enter a number in position 8 or characters in positions 1-8:

a. Press the **[PRI]** key repeatedly to cycle through characters **0-9, A-Z, -, *, $, /, +, %, \, |, _, <, >, h, blank**, then back to the start again.

   If you pass the desired character, press the **[PRI]** key repeatedly until you return to the start and reach that character again.

b. Press the **[FCN]** key to shift the display left by one position, leaving position 8 blank.

c. Press the **[PRI]** key repeatedly to enter the next character, or press the **[FCN]** key a second time to enter a blank space.

d. To abandon changes, press the **[CLR]** key, restoring the original label.

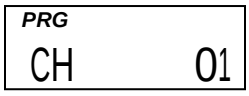
Press the **[ENT]** key to store changes and go back to the starting point for Channel 0 settings.

2.2.2.11 REVIEW CHANNEL 0 VALUES

Press the **[FCN]** key repeatedly to display each value in Channel 0, then return to the Channel 0 starting point.

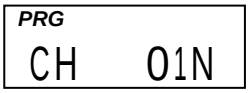
2.2.3 CHANNEL SETTINGS

At the starting point for Channel 0, the display shows '**PRG CH 00**.' At this point, a channel number can now be pressed to allow access to per-channel variables such as frequencies and Channel Guard values for that channel.



Press '**1**' and the display will show '**PRG CH 01**.' This is the starting point for entering channel 1 values.

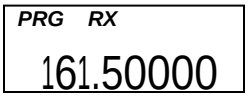
2.2.3.1 CHANNEL BANDWIDTH



At this point, pressing the **[#]** key will toggle the channel's bandwidth setting. An '**N**' will appear to the right of the channel number when the channel is set for 12.5/15 kHz channel bandwidth using the narrow band receiver filter. When there is no 'N' the channel is set for 25/30 kHz channel bandwidth.

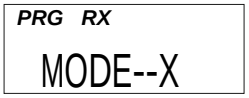
2.2.3.2 RECEIVE FREQUENCY

1. Press the **[FCN]** key and the upper part of the display will show '**PRG RX**.' This is the receive frequency for channel 1 (in MHz).
2. If the displayed frequency is correct, press the **[FCN]** key to advance to the next field.



3. If a new frequency is desired, press the **[CLR]** key followed by the digits of the desired frequency. Then press the **[ENT]** key to store this frequency and automatically advance to the next field.

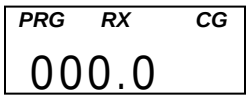
2.2.3.3 RECEIVE MODE



After the receive frequency is set, the upper part of the display will show '**PRG RX**,' and the lower part of the display will show '**Mode-X**', where X can be '**A**' for Analog Mode, '**D**' for Digital Mode, or '**M**' for Mixed Mode.

1. If the mode is correct, press the **[FCN]** key to advance to the next field.
2. If a new mode is desired, press the **[PRI]** key to cycle through the mode settings. Press **[ENT]** to store the new mode and automatically advance to the next field.

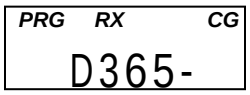
2.2.3.4 RECEIVE ANALOG CHANNEL GUARD



The next field is the Analog Channel Guard value for Channel 1 receive. This value is only used if the receive mode selected was Analog or Mixed, or if User Channel Guard is activated. The upper display will show '**PRG RX CG**' and the lower part of the display will show the programmed guard.

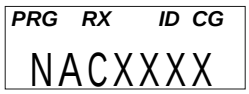
NOTE: 0.0 indicates carrier squelch operation (no Channel Guard).

1. If the displayed value is correct, press the **[FCN]** key to advance to the next field.
2. If a new value is desired, press the **[CLR]** key to reset the display to 0.0. Press the number keys 0 thru 9 to enter a CTCSS Channel Guard value. See "CTCSS Channel Guard Values" in section 2.4 of this manual. Press the **[ENT]** key to store the new value and automatically advance to the next field.



3. To enter a CDCSS Channel Guard value press the **[#]** key, causing the letter '**D**' to appear followed by three zeros. Enter the desired code using keys 0 thru 7 (keys 8 & 9 do not respond). See "CDCSS Channel Guard Values" in section 2.5 of this manual. Pressing the **[PRI]** key after the three-digit code has been entered allows the code to be inverted (a dash appears to the right of the number). When the displayed value is correct, press the **[ENT]** key to store the Channel Guard value and automatically advance to the next field.

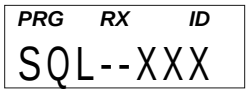
2.2.3.5 RECEIVE NAC



The next field is the Network Access Code (NAC) for Channel 1 receive. This value is only used if the receive mode selected was Digital or Mixed, or if User Channel Guard is activated. The upper part of the display will show '**PRG RX ID CG**'. The lower part of the display will show '**NACXXXX**' where XXXX is the Network Access Code in decimal.

1. If the NAC is correct, press the **[FCN]** key to advance to the next field.
2. If a new NAC is desired, press the **[CLR]** key followed by the digits of the desired NAC. Then press the **[ENT]** key to store this NAC and automatically advance to the next field.

2.2.3.6 SQUELCH MODE



The next field is the Receiver Squelch Mode for Channel 1. This setting is only used if the receive mode selected was Digital or Mixed, or if User Channel Guard is activated. The upper part of the display will show '**PRG RX ID**'.

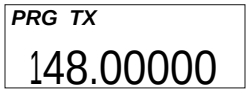
The lower part of the display will show '**SQL-XXX**' where XXX is '**NRM**' for normal squelch or '**SEL**' for selective squelch.

Normal squelch opens on a matching NAC and any Talk Group ID or Individual Unit ID. Selective squelch requires the correct NAC and the correct Talk Group ID, and for Unit-to-Unit calls, requires a matching Individual ID.

1. If the Squelch Mode is correct, press the **[FCN]** key to advance to the next field.

2. If a different Squelch Mode is desired, press the **[PRI]** key to toggle the setting. Then press the **[ENT]** key to store this setting and automatically advance to the next field.

2.2.3.7 TRANSMIT FREQUENCY



The upper part of the display will show '**PRG TX**.' This is the transmitter frequency for Channel 1.

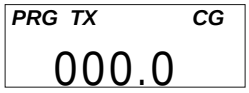
1. If it is correct, press the **[FCN]** key to advance to the next field.
2. If a new frequency is desired, press the **[CLR]** key followed by the digits of the desired frequency. Then press the **[ENT]** key to store this frequency and automatically advance to the next field.
3. If you want to operate this channel as a receive-only channel, press the **[CLR]** key (setting the display to 0.0) followed by the **[ENT]** key. The transmitter will be locked off for this channel.

2.2.3.8 TRANSMIT MODE

After the transmit frequency is set, the upper part of the display will show '**PRG TX**', and the lower part of the display will show '**Mode-X**', where X can be '**A**' for Analog Mode, '**D**' for Digital Mode, or '**M**' or Mixed Mode.

1. If the mode is correct, press the **[FCN]** key to advance to the next field.
2. If a new mode is desired, press the **[PRI]** key to cycle through the mode settings. Press **[ENT]** to store the new mode and automatically advance to the next field.

2.2.3.9 TRANSMIT ANALOG CHANNEL GUARD



The next field is the Analog Channel Guard value for Channel 1 transmit. This value is only used if the transmit mode selected was Analog or Mixed, or when User Channel Guard is activated. The upper display will show '**PRG TX CG**' and the lower part of the display will show the programmed guard.

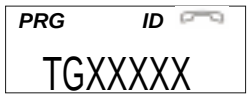
1. If the displayed value is correct, press the **[FCN]** key to advance to the next field.
2. If a new value is desired, press the **[CLR]** key to reset the display to 0.0. Press the number keys 0 thru 9 to enter a CTCSS Channel Guard value. See "CTCSS Channel Guard Values" in section 2.4 of this manual. Press the **[ENT]** key to store the new value and automatically advance to the next field.
3. To enter a CDCSS Channel Guard value press the **[#]** key, causing the letter '**D**' to appear followed by three zeros. Enter the desired code using keys 0 thru 7 (keys 8 & 9 do not respond). See "CDCSS Channel Guard Values" in section 2.5 of this manual. Pressing the **[PRI]** key after the three-digit code has been entered allows the code to be inverted (a dash appears to the right of the number). When the displayed value is correct, press the **[ENT]** key to store the Channel Guard value and automatically advance to the next field.

2.2.3.10 TRANSMIT NAC

The next field is the Network Access Code (NAC) for Channel 1 transmit. This value is only used if the transmit mode selected was Digital or Mixed, or if User Channel Guard is activated. The upper part of the display will show '**PRG TX ID CG**'. The lower part of the display will show '**NACXXXX**' where XXXX is the Network Access Code in decimal.

1. If the NAC is correct, press the **[FCN]** key to advance to the next field.
2. If a new NAC is desired, press the **[CLR]** key followed by the digits of the desired NAC. Then press the **[ENT]** key to store this NAC and automatically advance to the next field.

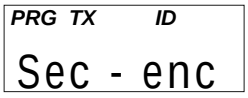
2.2.3.11 TALK GROUP ID



The next field is the Talk Group ID. This value is only used if the transmit mode selected was Digital or Mixed, or if User Channel Guard is activated. The upper part of the display will show '**PRG ID**' and the phone icon. The lower part of the display will show '**TGXXXXX**' where XXXXX is the Talk Group ID.

1. If the displayed value is correct, press the **[FCN]** key to advance to the next field.
2. If you wish to change it, press the **[CLR]** key followed by the digits for the new **TGID**, then **[ENT]** to store the new value and automatically advance to the next field.

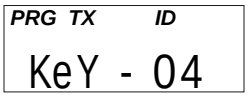
2.2.3.12 TRANSMIT SECURE MODE (Only on models configured for encrypted operation)



The next field is the Transmit Secure Mode setting. The upper part of the display will show '**PRG TX ID**' and the lower part of the display will show '**SEC – XXX**' where XXX can be '**CLR**' for always clear, '**ENC**' for always encrypted, or '**SW**' for selectable with the "TX Secure" switch.

1. If the mode is correct, press the **[FCN]** key to advance to the next field.
2. If a new mode is desired, press the **[PRI]** key to cycle through the mode settings. Press **[ENT]** to store the new mode and automatically advance to the next field.

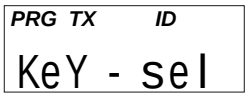
2.2.3.13 TRANSMIT KEY REFERENCE (Only on models configured for encrypted operation)



The next field is the Transmit Key Reference. The upper part of the display will show '**PRG TX ID**' and the lower part of the display will show '**KEY – XX**' where XX is the default key slot (1-32) used when transmitting on the channel. Encryption keys must be loaded into the 32 key slots using an APCO Project 25 compatible keyloader. In addition, the radio's key table must be configured with the DMH PC programming software to link the loaded keys to the key slots.

1. If the key is correct, press **[FCN]** to advance to the next field.
2. If a different key is desired, press **[PRI]** to cycle through the keys, or press the number buttons to directly enter the key number.
3. Press **[ENT]** to store the changes and advance to the next field.

2.2.3.14 TRANSMIT KEY LOCK (Only on models configured for encrypted operation)



The next field is the Transmit Key Lock option. The upper part of the display will show '**PRG TX ID**' and the lower part of the display will show '**KEY – XXX**' where XXX is the '**LCK**' if the default key is locked to the channel, or '**SEL**' if the channel can use a key selected from the Key Pick List that is accessed with the **[FCN]** button during normal radio operating mode.

1. If the setting is correct, press **[FCN]** to advance to the next field.
2. If a different setting is desired, press **[PRI]** to toggle between '**LCK**' and '**SEL**.'
3. Press **[ENT]** to store the changes and advance to the next field.

2.2.3.15 CHANNEL LABEL

The last field is the channel label.

1. If this label is correct, press the **[FCN]** key to proceed to the entry point.
2. If a new channel label is desired, follow the instructions under "Group Labels" in section 3.17.2 of this manual.

2.2.3.16 REVIEW CHANNEL SETTINGS

After the channel label is set, the display will return to the Channel 1 starting point. If you wish to review the Channel 1 settings, subsequent pressing of the **[FCN]** or **[ENT]** key will show each value and then return to the Channel 1 starting point.

2.2.3.17 PROGRAM ANOTHER CHANNEL

At the starting point for Channel 1, the display will show '**PRG CH 01**'. Press the number keys for another channel number to gain access to the frequencies, etc. for that channel. Each channel is then programmed using the same steps described for Channel 1.

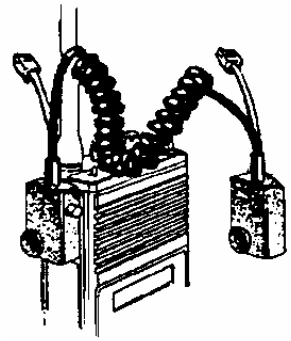
2.2.4 EXIT PROGRAMMING MODE

1. Press and release the OFF-VOL knob to turn the radio off.
2. The radio will be in normal Operating Mode the next time it is turned on.

2.3 CLONING RADIO SETTINGS

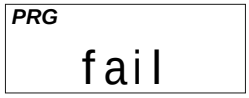
A BK Radio D Series portable radio can transfer its programmed settings to a DMH radio by using a standard cloning cable. To clone a DMH radio from an G or E Series portable, a special cloning cable must be used. Alphanumeric display settings, including channel and group labels, are not transferred from the E Series portable. See your dealer for details concerning cloning between D and G or E Series radios.

Both units must be of the same frequency band. Settings for any group in a portable radio can be downloaded to any group in the DMH radio. Cloning can only be accomplished group by group. To perform group cloning:



1. With the portable radio in normal operation mode, press the portable radio's **[#]** key followed by number keys to select the group to be downloaded.
2. Set the DMH radio to the group that is to receive the download. Press the microphone keypad **[#]** key followed by number keys, or press the GRP button and turn the Channel Selector knob.
3. Connect the Master end of the cloning cable into the microphone connector of the portable radio. This is the cable end with the pushbutton Master switch.
4 Put the portable radio into programming mode by holding down the Master switch and pressing the **[FCN]** key until the display shows **---ID**.
5. Enter the correct Password Code for the selected group.
6. Press the **[FCN]** key repeatedly to review the values in Channel 0. Make any required changes at this time.
7. Attach the other end of the cloning cable into the microphone connector of the DMH radio to be cloned.

8. Press the **[*]** key on the portable radio. The display will flash **PROG**, signifying that the radio is ready to download.
9. Press the **[FCN]** key. The program in the portable will download to the DMH.
10. If the download was successful, the portable radio will resume flashing **PROG**. Turn off the DMH radio. Disconnect the cable. Normal radio operation will occur the next time the DMH radio is turned on.



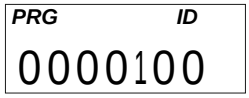
11. If the download was not successful the portable radio will flash **FAIL**, followed by continuous beeps.
    Failure to download the portable program can be due to:
    A. Incorrect radio types.
    B. Improper connection.
    C. Failure to power up radio.

    NOTE: To stop FAIL mode, press the **[CLR]** key, turn off the radios, and start again at Step 1.

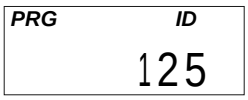
2.3.1 SPECIAL CLONING INSTRUCTIONS

It is possible to change Channel 0 values on the portable radio, hold them in a temporary memory, and download them to the DMH without actually entering them into the permanent memory of the portable radio. This is convenient for sequential identification numbers used to identify a series of radios in a radio system. Assuming that the frequencies, Code Guard values, and other Ch 0 values are common for all radios in the system, but that the radio identification number should be unique to each radio, the following method would be used to clone additional radios for the system.

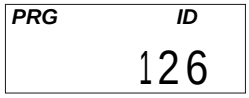
1. Program the portable radio with all frequencies, Code Guard values, and Channel 0 values that will be common to all DMH radios to be cloned.



2. Advance the display to show the portable radio's ID number-for example, **100**.



3. Press the **[CLR]** key; press **125**. Do not press the **[ENT]** key. Now 125 is in temporary memory.
4. Press the **[*]** key, connect the cable to the radios and download to the DMH by pressing the **[FCN]** key. ID number 125 is now stored in permanent memory of the DMH.
5. After download, press the **[CLR]** key on the portable radio. Disconnect the DMH. The portable radio display will show that 125 is still being held in the temporary memory of the portable radio.



6. Press the **[PRI]** key. This will increment the ID number one digit to 126. (Note: any new number can be entered at this point by pressing the **[CLR]** key and using the digit keys to enter the new number.)
7. Press the **[*]** key. Connect the cable to the second DMH and download by pressing **[FCN]**.
8. Any number of radios can be coded with different or sequential ID numbers using this technique. The ID number in the permanent memory of the portable radio will remain unchanged as 100.

2.3.2 SCAN LIST CLONING

When a portable radio downloads to a DMH, the Scan List is also transferred. See “Scan Operation” in section 3.11 for details on selecting the scan list.

2.4 CTCSS CHANNEL GUARD VALUES

The CTCSS Channel Guard system may be set for any frequency in the range of 67 to 255.9 Hz. However, since most systems adhere to the Electronic Industry Association (EIA) standards, tones should be selected from the following EIA list. In order to insure optimum performance, tone selection for use on the same radio frequency (RF) channel or adjacent channels in the same coverage area should be made from one of the Groups A, B, or C to the maximum degree possible.

GROUP A		GROUP B		GROUP C
67.0 (XZ)	*151.4 (5Z)	71.9 (XA)	146.2 (4B)	74.4
77.0 (XB)	162.2 (5B)	82.5 (YZ)	156.7 (5A)	79.7
88.5 (YB)	173.8 (6A)	94.8 (ZA)	167.9 (6Z)	85.4 (YA)
*100.0 (1Z)	186.2 (7Z)	103.5 (1A)	*179.9 (6B)	91.5 (ZZ)
107.2 (1B)	203.5 (M1)	110.9 (2X)	192.8 (7A)	
114.8 (2A)	218.1 (M3)	*118.8 (2B)	210.7 (M2)	
123.0 (3Z)	233.6	127.3 (3A)	225.7 (M4)	
131.8 (3B)	250.3	136.5 (4Z)	241.8	
141.3 (4A)				

* 50/60 Hz power distribution systems could cause falsing.

The assignments in a given area shall be made from within one of the Groups: A, B, or C.

2.5 CDCSS CHANNEL GUARD VALUES

Codes for the CDCSS Channel Guard system may be chosen from the following list. Since there are no EIA standards for the performance or compatibility of CDCSS Channel Guard systems it is recommended that an operational test be made on the intended system before wholesale assignments are made. In some cases either or both transmit and receive codes will require an inverted code to operate with existing systems. This can be done during the code programming of the system. Usually systems using direct Unit-to-Unit transmission (systems without mobile relays, repeaters, remote control, etc.) may use codes from the table. Systems with relays, etc., may use code variations for systems control and operational efficiency. The system operator or engineer should be consulted regarding the operational requirement on such systems.

023	065	131	165	245	315	411	466	612	703
025	071	132	172	251	331	412	503	624	712
026	072	134	174	261	343	423	506	627	723
031	073	143	205	263	346	431	516	631	731
032	074	152	223	265	351	432	532	632	732
043	114	155	226	271	364	445	546	654	734
047	115	156	243	306	365	464	565	662	743
051	116	162	244	311	371	465	606	664	754
054	125								

2.6 QUICK REFERENCE – CHANNEL 0

RADIO MICROPHONE PROGRAMMING

Group Password

Automatic Numeric Identification (ANI)

Transmitter Time-Out Timer

Scan Delay Time

Priority 1 Channel

Priority 2 Channel

Channel 0 Group One Functions

Reserved	1-12345
Group Scan List	1-12345
Transmit On Priority 1	1-12345
Priority 1 Lock	1-12345
Scan List Lock	1-12345

Channel 0 Group Two Functions

User Channel Guard Selection	2-12345
Busy Channel Operation	2-12345
ANI/DTMF Mode	2-12345

Channel 0 Group Three Functions

Reserved for Future Enhancements	3-12345
Reserved	3-12345
Reserved	3-12345
Alphanumeric/Numeric Display Mode	3-12345

Group Label

Flashing number indicates active function.

SECTION III
OPERATION

3.1 INTRODUCTION

This section contains information concerning the operational procedures for BK Radio DMH APCO Project 25 digital mobile radios. To meet backwards compatibility as defined by the APCO Project 25 standard, the DMH digital mobile radio provides users the ability to interoperate with narrow or wide band analog channels as well as digital systems. Please take a moment to read the information in this manual so you can get optimum performance from your new radio.

3.1.1 FEATURES

- APCO Project 25 FDMA Common Air Interface Compatible
- True Mixed-Mode Operation
    - RX – Automatically Detect Analog or Digital Signals
    - TX – Optional Auto-Respond in Last-Received Mode
- APCO Project 25 Conventional Operation
    - Group Calls
    - Unit-To-Unit Calls
- User-Programmable Call List
- Programmable Push Buttons
- Programmable Microphone Keypad Menu
- DTMF/ANI
- Transmit Time-Out Timer
- Group Scan
- Scan Delay
- Talkback Scan
- Nuisance Channel Delete
- Dual-Priority Scan with Channel Guard
- Alphanumeric Display
- Up to 400 Channels Available in 25 Groups of 16 Channels
- 2.5 kHz Interstitial Frequency Capability
- Microphone Keypad Lock

3.2 FCC REQUIREMENTS

Your radio must be properly licensed by the Federal Communications Commission prior to use. Your BK Radio dealer can assist you in meeting these requirements. Your dealer will program each radio with your authorized frequencies, signaling codes, etc., and will be there to meet your communications needs as your system expands.

3.2.1 RF ENERGY EXPOSURE AWARENESS AND CONTROL INFORMATION, AND OPERATIONAL INSTRUCTIONS FOR FCC OCCUPATIONAL USE REQUIREMENTS

BEFORE USING YOUR MOBILE 2-WAY RADIO, READ THE INFORMATION BELOW WHICH CONTAINS IMPORTANT OPERATING INSTRUCTIONS FOR SAFE USAGE AND RF ENERGY AWARENESS AND CONTROL INFORMATION FOR COMPLIANCE WITH RF ENERGY EXPOSURE LIMITS IN APPLICABLE NATIONAL AND INTERNATIONAL STANDARDS.

NOTICE: ***This radio is intended for use in occupational/controlled conditions, where users have full knowledge of their exposure and can exercise control over their exposure to meet FCC limits. This radio device is NOT authorized for general population, consumer, or any other use.***

This 2-way radio uses electromagnetic energy in the radio frequency (RF) spectrum to provide communications between two or more users over a distance. It uses radio frequency (RF) energy or radio waves to send and receive calls. RF energy is one form of electromagnetic energy; other forms include, but are not limited to, sunlight and x-rays. RF energy, however, should not be confused with these other forms of electromagnetic energy, which when used improperly, can cause biological damage. Very high levels of x-rays, for example, can damage tissues and genetic material.

Experts in science, engineering, medicine, health and industry work with organizations to develop standards for exposure to RF energy. These standards provide recommended levels of RF exposure for both workers and the general public. These recommended RF exposure levels include substantial margins of protection. All 2-way radios are designed, manufactured, and tested to ensure they meet government established RF exposure levels. In addition, manufacturers also recommend specific operating instructions to users of 2-way radios.

These instructions are important because they inform users about RF energy exposure and provide simple procedures on how to control it. Please refer to the following WEBSITES for more information on what RF energy exposure is and how to control your exposure to assure compliance with established RF exposure limits.

http://www.fcc.gov/oet/rfsafety/rf-faqs.html

http://www.osha.gov/SLTC/radiofrequencyradiation/index.html

3.2.2 FEDERAL COMMUNICATIONS COMMISSION REGULATIONS

The FCC rules require manufacturers to comply with the FCC RF energy exposure limits for mobile 2-way radios before they can be marketed in the U.S. When 2-way radios are used as a consequence of employment, the FCC requires users to be fully aware of and able to control their exposure to meet occupational requirements. Exposure awareness can be facilitated by the use of a product label directing users to specific user awareness information. Your BK Radio 2-way radio has an RF exposure product label. Also, your BK Radio owner's and service manuals include information and operating instructions required to control your RF exposure and to satisfy compliance requirements.

3.2.3 COMPLIANCE WITH RF EXPOSURE STANDARDS

Your BK Radio 2-way radio is designed and tested to comply with a number of national and international standards and guidelines (listed below) for human exposure to radio frequency electromagnetic energy. This radio complies with the IEEE and ICNIRP exposure limits for occupational/controlled RF exposure environment at operating duty factors of up to 50% talk-50% listen and is authorized by the FCC for occupational use only. In terms of measuring RF energy for compliance with the FCC exposure guidelines, your radio antenna radiates measurable RF energy only while it is transmitting (during talking), not when it is receiving (listening) or in Standby Mode.

Your BK Radio 2-way radio complies with the following RF energy exposure standards and guidelines:

- United States Federal Communications Commission, Code of Federal Regulations; 47 CFR §§ 1.1307, 1.1310, 2.1091 and 2.1093
- American National Standards Institute (ANSI) / Institute of Electrical and Electronic Engineers (IEEE) C95. 1-1992
- Institute of Electrical and Electronic Engineers (IEEE) C95.1-1999 Edition

3.2.4 INDUSTRY CANADA COMPLIANCE

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numerique de la classe B est conforme à la norme NMB-003 Canada.

3.2.5 RF EXPOSURE COMPLIANCE AND CONTROL GUIDELINES AND OPERATING INSTRUCTIONS

To control exposure to yourself and others and to ensure compliance with the RF exposure limits, always adhere to the following procedures.

Guidelines:

- User awareness instructions must accompany device when transferred to other users.
- Do not use this device if the operational requirements described herein are not met.

Operating Instructions:

- **Transmit no more than the rated duty factor of 50% of the time**. To transmit (talk), push the Push-To-Talk (PTT) button. The red LED will illuminate when the radio is transmitting. To receive calls, release the PTT button. The red LED will extinguish when the radio stops transmitting. Transmitting 50% of the time, or less, is important because this radio generates measurable RF energy exposure only when transmitting (in terms of measuring for standards compliance).
- **Transmit only when persons around the vehicle are at least 3 feet (90 centimeters) away from the vehicle with a properly installed antenna**. This separation distance will ensure that there is sufficient distance from a properly installed (according to installation instructions) externally-mounted antenna to satisfy the RF exposure requirements in the standards listed above.

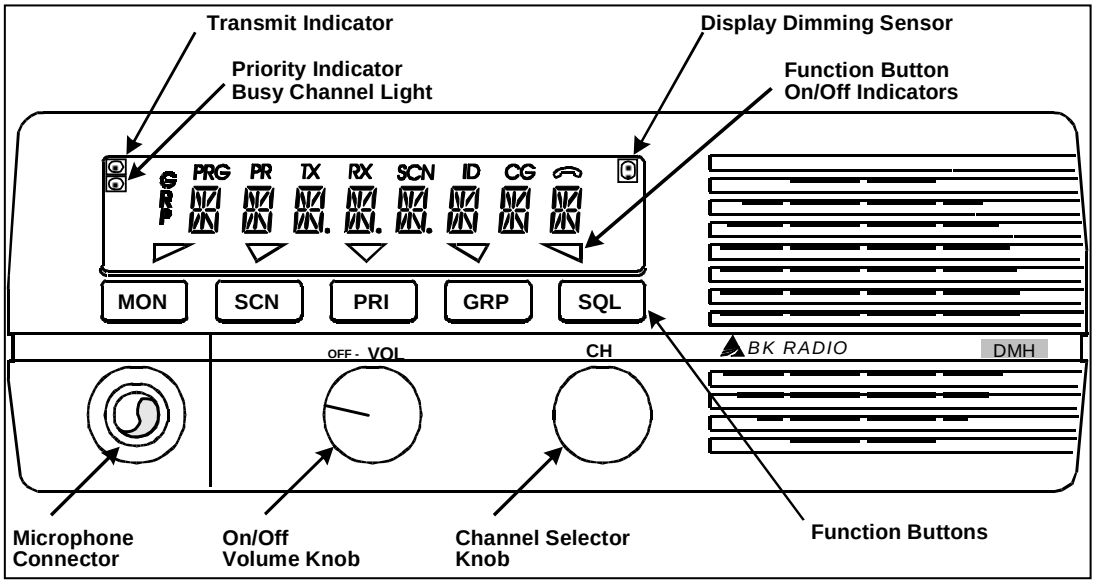
CONTACT INFORMATION

For additional information on exposure requirements or other information, visit website http://www.relm.com.

3.3 SAFETY PRECAUTIONS

- Do not operate the transmitter in close proximity to blasting caps.
- Do not operate the radio in an explosive atmosphere (petroleum fuels, solvents, dust, etc.).
- Do not operate the transmitter if a person outside the vehicle is less than three feet from the antenna or touching the antenna.

3.4 RADIO CONTROLS



3.5 BASIC OPERATION

3.5.1 RECEIVE

Turn power on by pushing and releasing the Volume knob. The radio will beep, indicating that it has passed its self test and is operational.

Set volume by pressing the **[MON]** button to hear squelch noise. Turn the Volume knob to set a comfortable volume level. Press the **[MON]** button again to stop squelch noise.

Select a channel group (if applicable) by pressing the **[GRP]** button and turning the Channel Selector knob. Press the **[GRP]** button again to return to Channel Select mode.

Select a channel by turning the Channel Selector knob. When the unstopped channel selector is rotated past the highest (16^{th}) channel, the radio will emit a beep and remain on the highest channel. When rotated past the lowest (1^{st}) channel, the radio will emit a beep and remain on the lowest channel.

The display can show channel numbers (Numeric Mode), channel labels (Alphanumeric Mode), or receive and transmit frequencies. The Display Mode and Channel Labels are programmed by the technician along with Group Labels (if applicable) and channel frequencies. The display shows slightly different indications during Channel Scan and Priority Scan operation in alphanumeric and numeric modes.

3.5.2 TRANSMIT

Press the PTT (Push-To-Talk) switch on the microphone. The **TX** annunciator appears on the display and the red Transmit indicator illuminates while the PTT is pressed. Talk in a normal voice with the microphone approximately one to two inches from your mouth. Release the PTT switch to stop transmitting.

If the **TX** annunciator does not appear and a tone is heard, you are on a receive-only channel or the channel is busy (if Busy Channel Lockout is enabled). Turn the Channel Selector knob to an authorized transmit channel or wait until the channel is clear (if Busy Channel Lockout is installed).

If the length of your transmission exceeds the preset Time-Out Timer setting, the transmitter automatically shuts off and a tone sounds. To continue the transmission, release the PTT switch, and then press it again and continue talking.

3.6 CHANNEL GUARD OPERATION

Channel Guard allows one radio or group of radios to be selectively called within a system. If the radio has been programmed with Channel Guard, use the following receive and transmit instructions.

3.6.1 ANALOG SQUELCH CONTROL

Sub-audible signaling (CTCSS/CDCSS) is used to allow a group of radios to be selectively called in a system. Programming the receive guard equal to zero allows for Carrier Squelch operation, where the radio will unmute whenever a carrier is detected.

3.6.2 APCO PROJECT 25 SQUELCH CONTROL

Network Access Codes (NACs) provide the digital equivalent of analog sub-audible signaling (CTCSS/CDCSS) allowing a group of radios to be selectively called within a system.

Users in the same area (using the same NAC) can be further divided into Talk Groups, with each group having its own Talk Group ID (TGID). Group Calls are made by designating both the users' NAC and TGID.

Each radio also has an individual P25 unit ID. A Unit-to-Unit call contains the addressee's NAC, and uses the addressee's P25 unit ID instead of the TGID.

When operating in Digital Mode, each channel can be programmed to use either Normal squelch or Selective squelch.

A. Normal Squelch

Normal squelch is used to mimic analog operation. Signals are only qualified with the programmed NAC. TGIDs and P25 Unit IDs are ignored. Each digital channel is programmed with a receive NAC and a transmit NAC. When an incoming signal's NAC matches the channel's programmed receive NAC, the radio unmutes. The default NAC is 659 ($293 hex). The digital equivalent of carrier squelch is achieved by programming the receive NAC = 3966($F7E hex) the radio will unmute when a digital signal with **any NAC** is detected. The 3966 ($F7E hex) NAC is reserved for receivers and is not allowed as a transmit NAC.

B. Selective Squelch

Selective squelch is used for processing 'Group Calls' and 'Unit-to-Unit Calls'. TGIDs are assigned on a per-channel basis. Users can be separated into Talk Groups with each group having its own TGID. Then, on channels programmed for Selective squelch, the incoming signal's NAC and TGID must match the channels programmed receive NAC and TGID for the radio to unmute. The default TGID is 1. The TGID value 65535 ($FFFF hex) is used to effect an "All Call". If the radio receives a signal with a matching NAC and the TGID = 65535 ($FFFF hex), it will unmute. Also, if the radio's programmed TGID is 65535 ($FFFF hex), it will open on any signal with a matching NAC, ignoring the incoming TGID. A TGID = 0 means "no one". If the radio is programmed with the TGID = 0, it will accept incoming group calls containing the "All Call" TGID, and correctly addressed Unit-to-Unit calls.

3.6.3 CHANNEL GUARD RECEIVE

Turn power on by pushing and releasing the Volume knob. The radio will beep, indicating that it has passed its self test and is operational.

Set volume by pressing the **[MON]** button to hear squelch noise. Turn the Volume knob to set a comfortable volume level. Press the **[MON]** button again to stop squelch noise.

Select a channel group (if applicable) by pressing the **[GRP]** button and turning the Channel Selector knob. Press the **[GRP]** button again to return to Channel Select mode.

Select a channel by turning the Channel Selector knob.

Press the **[CG]** button to disable or enable Channel Guard operation. On analog channels, the radio reverts to carrier squelch. On digital channels, the radio will unmute when a digital signal with **any NAC** is detected. An arrow on the display points to the **[CG]** button when Channel Guard is **disabled**. When Channel Guard is enabled, a message is heard only when the proper Channel Guard is received.

3.6.4 CHANNEL GUARD TRANSMIT

Monitor the channel, before transmitting on Channel Guard channels, by lifting the microphone off hook or pressing the **[MON]** button. Listen to the channel for a few seconds to ensure that no communications are occurring on the channel.

Press the PTT (Push-To-Talk) switch on the microphone. The TX annunciator appears on the display and the red Transmit indicator illuminates while the PTT is pressed. Talk in a normal voice with the microphone approximately one to two inches from your mouth. Release the PTT switch to stop transmitting.

Hang up the microphone when finished. If you pressed the **[MON]** button to monitor the channel, press it again after the transmission to return to Channel Guard operation.

3.7 MIXED MODE OPERATION

The receiver and transmitter are capable of operating in analog wide-band (25 kHz channel spacing), analog narrow-band (12.5 kHz channel spacing) and APCO Project 25 Digital Mode.

Each channel's Receive and Transmit Mode can be set independently as follows:

Mode	RX	TX
Analog	Receive qualified analog signals only	Transmit analog signals only
Digital	Receive qualified digital signals only	Transmit digital signals only
Mixed	Automatically receive qualified analog or digital signals	Transmit analog or digital signal, depending on the status of 'TX Digital' soft switch.

Digital receptions and transmissions will be indicated by illuminating the '**ID**' annunciator in addition to the '**RX**' or '**TX**' annunciator.

3.7.1 MIXED MODE TALKBACK

If Mixed Mode Talkback is enabled, transmissions initiated while hold time remains will be in the same mode as the received signal, if the signal was received on the Ready to Transmit (RTX) channel. Depending on programming, the RTX channel can be the main channel, a held scan or priority channel if Talkback Scan is enabled, or the Priority 1 channel if TX on PR1 is enabled. TX Mode on the RTX channel must be set to **MIXED**.

While hold time after a reception remains, transmissions will be in the same mode as the received signal, regardless of the status of the 'TX Digital' soft switch. As in Talkback Scan, the RTX channel and receive annunciators will be displayed for the duration of the timer.

The talkback timer can be cleared by making the held channel invalid. For instance, if a scan channel is being held, turn scan off.

3.8 SECURE OPERATION

The radio may optionally be configured for Secure communication on channels operating in Digital Mode. No encryption is available for analog channels.

The receiver automatically detects both clear and secure signals.

The transmitter selects clear or secure operation based on each channel's programming. Digital channels can be programmed to always transmit encrypted, always transmit clear, or to select the Transmit Mode with the 'TX Secure' switch.

If enabled by programming, a 'Clear TX-mode Warning Beep' will sound whenever the radio transmits in Clear Mode.

The display indicates Secure Operation as follows:

1. In Standby Mode, if the radio will transmit in Secure Mode when PTT is pressed, the encrypt icon flashes in the display.

2. When receiving or transmitting an encrypted signal, the encrypt icon flashes in the display.

3.8.1 TRANSMIT KEY SELECTION

The radio can hold up to 32 DES or AES encryption keys. Each channel is assigned a default key for transmit. The key can be locked to the channel, or if programming allows, a transmit key other than the default key can be selected from the radio's Key Pick List. If a key is selected from the pick list, it will be used during transmit on every channel that allows selectable keys.

To access the Key Pick List, press the microphone's **[FCN]** button. The display momentarily shows '**KEY ##**', where ## is the number of the currently selected transmit key, and then shows the key's label. If no key has been selected (default keys are being used), the display shows '**KEY DFLT**.' If the **[FCN]** button is pressed again, the radio displays the first of any soft switches assigned to the function menu. See "Programmable Push Buttons/Microphone FCN Key Menu" in section 3-10 of this manual.

Press the microphone's **[PRI]** button to step through the list of key labels, or enter the number of the desired transmit key. Press the **[ENT]** button to activate the selected transmit key. Press "0" or the **[CLR]** button to return to using default (pre-programmed) transmit keys on all channels.

If a key is selected that has not been programmed, when PTT is pressed, the radio will not transmit but will beep and display '**NO KEY**'.

3.8.2 ZEROIZATION

The radio provides a method for the user to panic-zeroize all encryption keys. This service also sets all touchpad passwords to 'FFFFFF'. The zeroization service is invoked as follows:

- Press and hold the microphone's **[CLR]** button.
- Wait for the radio to start beeping and for the '**ZERO ALL**' message to appear on the display.
- While continuing to hold the **[CLR]** button, press and release the PTT switch.
- Release the **[CLR]** button.
- The radio will stop beeping and the '**ZEROIZED**' message will appear on the display after all keys are destroyed.

If the **[CLR]** button is released before PTT is pressed, keys and passwords will not be destroyed, and '**CANCELED**' will appear on the display.

3.9 CHANNEL GROUPS

Radios are separated into groups of 16 channels each. Each group of 16 channels can be programmed to have an "individual personality" with its own set of operational features.

1. Select a channel group (if applicable) by pressing the **[GRP]** button and turning the Channel Selector knob. Press the **[GRP]** button again to return to channel select mode. See "GRP" on page 3-11 of this manual.

2. Select a channel by turning the Channel Selector knob. When the unstopped channel selector is rotated past the highest (16^{th}) channel, the radio will emit a beep and remain on the highest channel. When rotated past the lowest (1^{st}) channel, the radio will emit a beep and remain on the lowest channel.

3.10 PROGRAMMABLE PUSH BUTTONS/MICROPHONE FCN KEY MENU

When the radio is installed, labels are placed on the front push buttons to indicate their functions. An arrow on the display points to each front mounted push button that is active. The five push buttons can be programmed with the following functions:

Standard Functions		Optional Functions			
MON	Monitor Squelch Noise	**TA**	Repeater Talk Around	**GSC**	Group Scan
SCN	Channel Scan	**CG**	Channel Guard Disable	**PA**	Public Address
PRI	Priority Scan	**HOM**	Home Channel	**SEC**	Transmit Secure
GRP	Group Select	**SPK**	Remote Speaker	**ACC**	Accessory 1
SQL	Squelch Adjust	**NXT**	Next Scan Channel	**ACC**	Accessory 2
TXD	Transmit Digital Mode	**LPW**	Low Power Select	**ACC**	Accessory 3

If a keypad microphone is used with the DMH radio, many of the functions above may also be enabled/disabled with the keypad **[FCN]** key. Not all microphones support these functions. Contact your dealer to determine which features are available with your microphone and have been enabled in the radio.

- Press the **[FCN]** key to display the function menu.
- Press **[PRI]** to toggle the function on/off when the desired menu item is displayed.
- Repeatedly press **[FCN]** to step through the menu.
- When the display flashes, the function is enabled.
- Press **[ENT]** to exit the **[FCN]** menu.

3.10.1 MICROPHONE KEYPAD LOCK

To lock/unlock the microphone's keypad, press and hold the **[FCN]** key. When locked, "LOCKED" will be displayed if a key is pressed and a low beep will sound.

LOCKOUT EXCEPTIONS:

1. If enabled, a long **[PRI]** key press will activate Emergency Mode even when the microphone's keypad is locked.
2. PTT unlocks the keypad during transmit for DTMF key presses.
3. The keypad will be automatically unlocked when Unit-To-Unit Mode is entered by pressing PTT to respond to a Unit-To-Unit call, when Unit-To-Unit callback is enabled. The keypad will be re-locked when Unit-To-Unit Mode is exited.

3.10.2 PUSH BUTTON CONTROLS

MON Monitor Squelch Noise

Press the **[MON]** button to start or stop monitoring squelch noise. This allows you to set a comfortable volume level.

SCN Channel Scan

Press the **[SCN]** button to start or stop scanning channels in the scan list. The flashing ***SCN*** annunciator will appear on the display. Scan operation occurs only while the radio is not transmitting. If changes to the scan list are allowed, to add or delete the current channel from the Scan List, turn Scan and Priority Scan off, then press the **[SCN]** button and hold it down for 1 second or more.

PRI Priority Scan

Press the **[PRI]** button to start or stop priority scanning. The ***PR*** annunciator and the flashing ***SCN*** annunciator appear on the display. If changes to the Priority 1 channel are allowed to make the current channel the fixed Priority 1 Channel, turn Scan and Priority Scan off, then press the **[PRI]** button and hold it down for 1 second or more.

GRP Group Select

Press the **[GRP]** button to toggle between Group Select and Channel Select Modes. Press the **[GRP]** button for Group Select Mode. Turn the Channel Selector knob to select a group. Return to Channel Select Mode by waiting 5 seconds, or by pressing the **[GRP]** button one time (numeric mode) or two times (alphanumeric mode). After selecting a group in Alphanumeric Mode, press the **[GRP]** button one time to display the Group Label, and a second time to return to Channel Select Mode.

SQL Squelch Adjust

Press the **[SQL]** button to toggle between Squelch Adjust and Volume Adjust Modes.

Press the **[SQL]** button for Squelch Adjust Mode. Turn the Volume knob to adjust the squelch setting. Turning the knob counter-clockwise tightens the squelch setting, allowing only stronger signals to open the squelch and be heard. In the absence of a held channel, the receiver will be tuned to the main channel. Guard qualification will be disabled during squelch adjustment.

Return to Volume Adjust Mode by waiting 5 seconds, or by pressing the **[SQL]** button again.

Pressing the **[SQL]** button and holding for more than 1 second sets the squelch to its factory preset value.

TA Repeater Talk Around

Press the **[TA]** button to turn Repeater Talk Around on or off. When **TA** is on, the radio transmits on the receive frequency of the selected channel, bypassing or “talking around” the repeater. This function may be used on any channel that is programmed to a frequency pair (repeater channel).

CG Channel Guard Disable

Press the **[CG]** button to disable or enable Channel Guard operation. On analog channels, the radio reverts to carrier squelch. On digital channels, the radio will unmute when a digital signal with **any NAC** is detected. An arrow on the display points to the **CG** button when Channel Guard is **disabled**. When Channel Guard is enabled, a message is heard only when the proper Channel Guard is received. Transmit Channel Guard generation is unaffected. The **CG** button may also be used to override Busy Channel Lockout, if Busy Channel Override is installed.

HOM Home Channel

Press the **[HOM]** button to go to the pre-programmed Home Channel.

To set a different Home Channel, select the desired channel using the Channel Selector knob, press the **[HOM]** button, and hold it for more than 1 second until the arrow above the **HOM** button appears on the display. The new channel then becomes the Home Channel.

SPK Remote Speaker

Press the **[SPK]** button to toggle between the built-in radio speaker and a remotely mounted speaker.

NXT Next Scan Channel

Press the **[NXT]** button to select the next consecutive channel in the Scan List (not during scan operation).

LPW Low Power Select

Press the **[LPW]** button to toggle between high power and low power transmitter operation. Transmitter power settings can be programmed from 15 to 50 watts. If per-channel power is enabled, channels locked to low power will always transmit in low power mode regardless of the state of the **LPW** button.

GSC Group Scan

Press the **[GSC]** button to enable or disable Group Scan operation. During Group Scan operation, the following features are disabled: Priority Scan, User Channel Guard, and Nuisance Channel Delete.

Turn Group Scan off, then press the **[GSC]** button for 1 second or more to toggle the current group on or off the Group Scan List.

PA Public Address

Press the **[PA]** button to turn the Public Address system on or off. When **PA** is on, pressing the microphone PTT switch causes audio to be routed to the audio amplifier without enabling the transmitter.

ACC Accessory

Press the **[ACC]** button to turn the installed accessory on or off. Up to three **ACC** buttons may be installed for different accessories.

3.11 SCAN OPERATION

3.11.1 RECEIVE

Scan operates only while the radio is not transmitting. The radio checks for signals on channels in the preset scan list, as well as the channel selected by the Channel Selector knob.

When a signal is detected, scanning stops and the message is received. The received channel is shown in place of the transmit channel.

Once the signal ends, the radio continues to monitor the channel for the preset scan delay time before it resumes scanning.

3.11.1.1 BASIC SCAN

1. Press the SCN button to enable Scan (an arrow will appear above the button).

2. If Priority Scan is enabled, press the PRI button to turn it off.

The display indicates Scan operation by flashing the **SCN** annunciator (alphanumeric mode) or by two flashing bars (numeric mode).

3.11.2 SCAN CHANNEL GUARD CHANNELS

1. Press the SCN button to enable Scan (an arrow will appear above the button).

2. If the CG button has an arrow over it, press the CG button once to turn Channel Guard Disable off.

When a signal is detected, scanning stops while the radio checks for the proper Channel Guard value. If the signal contains the proper Channel Guard value, the radio receives the message. Otherwise, the radio resumes scanning immediately.

3.11.3 NUISANCE CHANNEL DELETE

With Channel Scan on and Nuisance Channel Delete enabled, pressing and holding the **[SCN]** button for more than 1 second will temporarily remove a currently active channel from the Scan List. If the radio is equipped with a keypad microphone, pressing the **[CLR]** key while Scan is on will accomplish the same thing. Not all microphones support these functions. Contact your dealer to determine which features are available with your microphone and have been enabled in the radio. When the radio is powered off and back on, the pre-programmed Scan List will be restored.

3.11.4 TRANSMIT WITH SCAN ON

When operating in Scan mode, the radio transmits on the channel selected by the Channel Selector knob.

1. Select a transmit channel by turning the Channel Selector knob.

2. Press and hold the PTT switch and talk in a normal voice. When the PTT switch is released, the radio continues to monitor the selected channel for the preset scan delay time before it resumes scanning.

3.11.5 TALKBACK SCAN

If your radio is programmed for Talkback Scan, press PTT while a channel is active or while scan delay time remains. You will be responding on the transmit frequency of the received channel.

Talkback Scan will not work if Priority Scan is also on and your radio is programmed to always transmit on the Priority 1 channel.

3.11.6 CHANGE THE SCAN LIST

The radio can be programmed to enable the user to add or remove channels from the scan list. If user changes are enabled, follow these steps to change the scan list:

1. Turn Scan and Priority Scan off.

2. Select a channel to be added or removed from the scan list by turning the Channel Selector knob. If the channel is already on the scan list, **SCN** appears in the display.

3. Press and hold the **[SCN]** button for more than 1 second to toggle the channel on or off the scan list.

3.11.7 GROUP SCAN

Channels on each "Channel Scan List" in groups on the "Group Scan List" are scanned sequentially. The selected group is always scanned when Group Scan is enabled, even if that group is not on the Group Scan List.

When Group Scan is enabled, the following features are disabled:

- Priority Scan
- Dual Priority Scan
- User-Selected Channel Guard
- Nuisance Channel Delete

3.12 PRIORITY SCAN

Priority Scan enables the radio to receive on any channel while monitoring for a message on the designated priority channel(s). The radio samples each priority channel at a preset rate (.25-2.0 seconds) regardless of activity on any other channel. Priority Scan operates only while the radio is not transmitting and can be used in combination with scan operation.

When Priority Scan is on, the **PR** annunciator illuminates, and the display flashes ***SCN*** (alphanumeric mode) or two flashing bars (numeric mode). If a message is received on a priority channel, the Priority indicator illuminates, and the radio receiver locks onto that channel for the duration of the transmission, unless a higher priority channel interrupts.

Priority Scan can be used in combination with Channel Guard with:

- Priority Scan on (arrow appears above PRI button)
- Channel Guard Disable off (no arrow above CG button)
- The Priority Channel(s) programmed with Channel Guard

If a message is received on a priority channel, the radio receiver locks on to the priority channel and checks to see if the proper Channel Guard value is present. If the signal contains the proper Channel Guard value, the radio receives the message. Otherwise, the radio will re-check the channel every 4 seconds, until the activity on the channel ceases.

3.12.1 DUAL PRIORITY SCAN

In each group, up to two of the 16 channels can be designated as priority channels. These two, PR1 and PR2, are periodically tested for activity, even if a different transmission is being listened to. Activity on PR2 preempts activity on any of the non-priority channels. Receptions on PR1 have priority over any other channel in the group, including PR2.

Either priority channel can be programmed as a fixed channel, tied to the Channel Selector knob, or programmed OFF. If the radio is programmed to transmit on the first priority channel, transmissions will occur on PR1 if PR1 isn't programmed OFF, when operating in Dual Priority Scan Mode.

If PR1 is a fixed channel, and changes to the 1st priority channel are allowed, the user can move the channel selector to a new channel and press and hold the **[PRI]** button for more than 1 second to choose a new PR1 channel.

Dual Priority Scan is automatically disabled when Group Scan is on.

3.12.2 OLD-STYLE BK PRIORITY SCAN

The radio can be programmed with one of three Priority Modes: A, B, or C. The table below shows how the priority channels and the transmit channels are selected in each mode.

	Mode A	**Mode B**	**Mode C**
Priority Channel	Channel Knob	Preset	Preset
Transmit Channel	Channel Knob	Channel Knob	Priority Channel

3.12.3 PRIORITY MODE A WITH SCAN

In Priority Mode A, the priority channel is set by the Channel Selector knob. Priority Mode A is seldom used by itself because the radio receives and transmits only on the knob-selected channel.

When Scan and Priority Mode A are enabled, scanning occurs until an active scan channel is found. The radio receives the message while continuing to check the priority (knob-selected) channel. The display shows the scan channel.

If the priority channel becomes active during this message, the Priority indicator illuminates. The radio changes to the priority channel and holds for the duration of the message. The display shows the priority channel.

To reply to a message on the priority channel, press the PTT switch and transmit on the priority channel. Once activity ceases on the priority channel, the radio returns to scan operation.

3.12.4 PRIORITY MODE B

With Priority Scan on and Channel Scan off, the radio can receive on the knob-selected channel while sampling the priority channel. If the priority channel becomes active, the Priority indicator lights up illuminates. The radio changes to the priority channel and holds for the duration of the transmission

To reply to a message on the priority channel, turn the Channel Selector knob to the priority channel, and then transmit.

3.12.4.1 PRIORITY MODE B WITH SCAN

With Priority Scan and Channel Scan on, the radio scans until it locks on to an active channel. The radio continues to sample the priority channel while listening to the active scan channel.

If activity occurs on the priority channel, the radio overrides the active scan channel, changes to the priority channel, and holds for the duration of the transmission.

To reply to a message on the priority channel, turn the Channel Selector knob to the priority channel, and then transmit. Once activity has ceased on the priority channel, the radio returns to scan operation.

3.12.5 PRIORITY MODE C

With Priority Scan on and Channel Scan off, the radio samples the fixed priority channel at the preset rate. If activity occurs on the priority channel, the radio switches to the priority channel and holds for the duration of the transmission.

To reply to a message heard on the priority channel, press the PTT switch. The radio transmits only on the priority channel when Priority Scan is on. Once activity has ceased on the priority channel, the radio returns to the receive channel on the Channel Selector knob.

3.12.5.1 PRIORITY MODE C WITH SCAN

With Priority Scan and Channel Scan on, the radio scans until it locks on to an active channel. The radio continues to sample the priority channel while listening to the active channel. If activity occurs on the priority channel, the radio overrides the active scan channel, changes to the priority channel, and holds for the duration of the transmission.

To reply to a message heard on the priority channel, press the PTT switch. The radio transmits only on the priority channel when Priority Scan is on. Once activity has ceased on the priority channel, the radio returns to scan operation.

3.12.6 CHANGE THE PRIORITY 1 CHANNEL

The fixed Priority 1 channel can be permanently set or can be changeable. If the radio has a changeable priority channel, use the following steps to make this change.

1. Turn Scan and Priority Scan off.

2. Turn the Channel Selector knob to the channel you want to enter as the new Priority 1 channel.

3. Press and hold the **[PRI]** button for more than 1 second. A short beep sounds and **PR** appears in the display, indicating that the displayed channel is now the priority channel.

   NOTE: If the radio is programmed for Dual Priority operation, only Priority 1 channel can be changed with the **[PRI]** button.

   NOTE: A channel can be the priority channel even if it is on the Scan List. Due to multiple sampling of the same channel, however, maximum performance occurs when the priority channel is not on the Scan List.

3.13 UNIT-TO-UNIT CALL

P25 Unit IDs allow for Unit-To-Unit calls when the radio is operating in Digital Mode. The microphone's **[*]** key must be enabled by radio programming to allow this mode of operation. To view the radio's ID, press and hold the **[*]** key while not in Unit-To-Unit Mode. (Unit-To-Unit Mode is indicated by a phone icon in the upper right corner of the display). Channels programmed for analog only operation will not be able to transmit or receive Unit-To-Unit calls.

3.13.1 UNIT-TO-UNIT MODE

When the radio is in Unit-To-Unit Mode, all scanning functions will be disabled. The radio will receive and transmit on the Ready-to-Transmit (RTX) channel only. Depending on programming, the RTX channel can be the main channel, a held scan or priority channel if Talkback Scan is enabled, or the Priority 1 channel if TX on PR1 is enabled. To alert the user that the radio is in Unit-To-Unit Mode, a beep will periodically sound until the unit is returned to normal Operating Mode.

If the RTX channel's Digital Squelch Mode is set to 'selective', the radio will accept group calls, correctly addressed Unit-To-Unit calls, and if RX Mode is set to mixed, analog signals.

When a correctly addressed Unit-To-Unit call is received, the radio will beep twice. If the calling unit's ID matches one of the Call List IDs, the associated label will be displayed along with the RX and phone icon. Otherwise, the numeric ID will be displayed along with the RX, ID, and phone icon.

If the calling unit is not the same unit displayed before the call was received, the calling unit's ID will be displayed for the duration of the reception. The previously displayed ID will remain the default transmit ID, but the interrupting ID will be captured as 'last active'. To speak to the interrupting caller, press **[*]** to make the last active ID the new default transmit ID.

When a group call (or, if allowed, an analog signal) is received, the radio will display the RTX channel's label for the duration of the reception.

If the RTX channel's Digital Squelch Mode is set to 'normal', the radio performs as when the Squelch Mode is 'selective', except all individual calls will be received when the incoming NAC matches the channel's programmed receive NAC, not just individual calls addressed to the unit. Individual calls not addressed to the unit will be indistinguishable from group calls. Only the channel label will be displayed, not the ID of the calling unit.

If Unit-To-Unit Mode is entered when the RTX channel is programmed for analog-only transmissions, pressing PTT will cause the radio to beep until PTT is released. **The user must select a channel capable of digital transmissions before placing**

a Unit-To-Unit call. If the RTX channel is programmed for Mixed Mode transmit, transmissions will be made as digital Unit-To-Unit calls while the radio is in Unit-To-Unit Mode, regardless of the position of the 'TX Digital' switch.

3.13.2 INITIATING A UNIT-TO-UNIT CALL

To initiate a Unit-To-Unit call, press the microphone's **[*]** key to enter Unit-To-Unit Mode. The label of the last active (called or received) ID will appear on the display.

If the last active ID was a Call List ID, its label will be displayed along with the phone icon, otherwise the numeric ID will be displayed along with the phone and ID icon. If a label is displayed, press and hold **[#]** to view the corresponding numeric ID.

To place a call to the displayed unit, press PTT. To choose another unit, use the microphone's keypad to enter the desired call list entry (0 - 9), or press **[PRI]** repeatedly to cycle through all call list entries, or press **[#]** to manually key in a new ID (up to 7 digits). To re-select the 'last active' ID, press the **[*]** key. Once the new unit ID is selected or entered, press PTT to place the call.

To exit Unit-To-Unit Mode, press and hold the microphone's [*] key.

3.13.3 RECEIVING A UNIT-TO-UNIT CALL

When a Unit-To-Unit call is received while the radio is in normal Operating Mode, the radio will beep twice. The display will show the ID of the calling unit. If the ID matches one of the Call List IDs, the associated label will be displayed along with the RX and phone icons. Otherwise the numeric ID will be displayed along with the RX, phone, and ID icons. The calling unit's ID will be displayed for the duration of the reception, and once the signal goes away, for a programmed hold time. When the hold time expires, the display will return to the normal Operating Mode display, but the phone icon will flash until the microphone's **[*]** key is pressed, putting the radio in Unit-To-Unit Mode, displaying the last active ID.

3.13.4 UNIT-TO-UNIT CALLBACK

If Unit-To-Unit callback is enabled, and a Unit-To-Unit call is received on the Ready-to-Transmit (RTX) channel, the user may press PTT before the hold time expires, causing the radio to enter Unit-To-Unit Mode and transmit using the received ID as the destination ID. If the callback timer expires before PTT is pressed, the radio will return to normal Operating Mode, but the phone icon will flash until the [*] key is pressed, bringing up the last active ID.

To exit Unit-To-Unit Mode, press and hold the microphone's [*] key.

The callback timer can be cleared by making the held channel invalid. For instance, if a scan channel is being held, turn scan off.

3.13.5 PROGRAMMING UNIT-TO-UNIT CALL LIST

Press the microphone's **[*]** key to bring up the last active ID. If the last active ID was a Call List ID, the ID's label will be displayed along with the phone icon. Otherwise, the ID number will be displayed along with the phone and ID icon.

Press a number key (0 – 9) to go directly to the desired Call List ID, or press **[PRI]** repeatedly to cycle to the label of the ID to be re-programmed. Press and hold the **[FCN]** key to enter ID Programming Mode (***PRG*** icon will be illuminated). As in keypad Programming Mode, normal radio function will be disabled until ID Programming Mode is exited.

3.13.6 PROGRAMMING A LABEL

Press the **[CLR]** key. The display becomes blank.

Press number keys to enter 0-9 in positions 1-7. The digits start in position 7, then move left.

1. Press the **[#]** key to toggle a decimal on or off to the right of the character in position 7. The decimal moves left with the number in position 7 as new numbers are entered.

2. Use the following steps to enter a number in position 8 or characters in positions 1-8:

   a. Press the **[PRI]** key repeatedly to cycle through characters **0-9, A-Z, -, *, $, /, +, %, \, |, _, <, >, h**, **blank**, then back to the start again.

      If you pass the desired character, press the **[PRI]** key repeatedly until you return to the start and reach that character again.

   b. Press the **[FCN]** key to shift the display left by one position, leaving position 8 blank.

   c. Press the **[PRI]** key repeatedly to enter the next character, or press the **[FCN]** key a second time to enter a blank space.

   d. To abandon changes, press the **[CLR]** key, restoring the original label.

   e. Press the **[ENT]** key to store changes.

3.13.7 PROGRAMMING A NUMERIC ID

Press **[ENT]** to display the numeric ID. Press **[CLR]**, then enter the new ID (up to 7 digits). Press **[ENT]** to store the new ID. Select a new ID to be programmed, or press and hold **[ENT]** to exit Programming Mode (the ***PRG*** annunciator will be extinguished).

3.14 EMERGENCY CALL

Note: Emergency operation only applies to channels programmed for Digital or Mixed Mode transmissions. If the channel is programmed for Mixed Mode transmissions, the 'TX Digital' switch must be ON.

To place an emergency group call, press and hold the emergency button until the radio beeps and the display flashes. On some models, the emergency button may be the microphone's **[PRI]** key. All scanning and priority scanning functions will be disabled. If the radio is in Unit-To-Unit Mode, that mode will be exited and the radio will be placed in Emergency Mode. Each subsequent press of PTT will cause the

radio to transmit on the knob-selected channel with the emergency bit set, indicating an emergency condition. If the Channel Selector is changed, the Emergency Mode will follow to the newly selected channel. Cycle power to return the radio to normal operation.

On channels programmed for analog transmissions, and channels programmed for Mixed Mode transmissions with the 'TX Digital' switch OFF, pressing PTT in Emergency Mode will result in a normal analog transmission.

3.15 USER SELECTED CHANNEL GUARD

User Selected Channel Guard is only available on radios equipped with a keypad microphone. Not all microphones support this function. Contact your dealer to determine which features are available with your microphone and have been enabled in the radio.

When the radio is being programmed with transmit and receive frequencies for each channel, a receive Channel Guard value and a transmit Channel Guard value can also be assigned to each channel. If User Channel Guard Selection is enabled, the Channel Guard values for any channel can be copied to another channel in the radio. On channels programmed for Analog operation only, the CTCSS or CDCSS guard values will be copied. On channels programmed for Digital operation only, NAC's only will be copied unless the radio is programmed to also copy the Talk Group ID (TGID), Mode (Digital, Analog or Mixed) and Squelch setting (Normal or Selective). On Mixed Mode channels, Analog or Digital values will be copied as needed.

For example, to use the Channel Guard values of Channel 9 with the frequencies of Channel 5:

1. Turn Scan and Priority Scan OFF.

2. Turn the Channel Selector knob to Channel 5.

3. Press the **[9]** key on the microphone keypad. The display shows **CG**.

   The radio will now operate on the frequencies of Channel 5 with Channel 9 Channel Guard values. The display shows the Channel Guard channel (9), and then the selected channel (5).

4. Press the microphone's **[#]** key to display the Channel Guard channel briefly. The display shows the group number, followed by the Channel Guard channel, and then the selected channel.

5. Press the **[0]** key to reset all values to the original programming, or press different number keys (1-16) to select a different set of Channel Guard Values.

NOTE: During Scan or Priority Scan, the receiver does not use the user-selected Channel Guard values. However, user-selected Channel Guard values are used by the transmitter in Scan Mode.

3.16 OTHER OPERATIONAL FEATURES

The BK Radio D Series radio is based on a microprocessor core that allows extra features and operational characteristics to be programmed into the radio. Your dealer can help define the best operational settings for your system and program them into the radio.

3.16.1 SCAN DELAY

Scan delay lets the radio receive a response to a transmission before scanning the other channels for activity. If you find that your scanner is restarting before message replies are received, you can ask your dealer to increase the scan delay time (0-7.5 seconds).

This timer is also used to allow for Talkback Scan, Mixed Mode Talkback, and Unit-To-Unit Callback.

3.16.2 HI/LO POWER

Each channel in the radio can be individually programmed to always transmit in low-power mode, regardless of the position of the radio's LPW button (or microphone keypad **[FCN]** menu setting). If the programming for the channel allows high-power transmissions, the power level can be selected with the LPW button or the keypad **[FCN]** menu.

3.16.3 DTMF ENCODING (Analog Mode Only)

Radios with keypad-equipped microphones can be programmed to enable DTMF (Dual Tone Multiple Frequency) encoding. To send DTMF tones (similar to the tones used by a standard push-button telephone):

1. Press and hold the PTT switch.

2. Press any of the keys on the microphone’s keypad.

You will hear a sidetone.

The **FCN**, **PRI**, **ENT**, and **CLR** keys respond as DTMF tones A, B, C, and D, respectively.

3.16.4 ANI ENCODING (Analog Mode Only)

ANI encoding (Automatic Number Identification), if enabled, transmits a sequence of DTMF tones each time you press the PTT switch. You will hear a sidetone. Your dealer can program the ANI number to be sent.

If DTMF and ANI are both enabled, the ANI tone sequence is transmitted only after the microphone’s **[ENT]** key is pressed while the PTT switch is activated. You will hear a sidetone.

3.16.5 TIME-OUT TIMER

The transmit Time-Out Timer limits the duration of calls and guards against accidentally locking on the transmitter and tying up the radio system. Your dealer can program the duration of the Time-Out Timer (15-225 seconds, or disabled).

3.16.6 BUSY CHANNEL

If the radio has been programmed for Busy Channel operation, it will operate in one of the following three Modes:

- Busy Channel Indication
- Busy Channel Lockout
- Busy Channel Lockout with Override

3.16.6.1 BUSY CHANNEL INDICATION

The yellow Busy Channel Indicator glows if there is carrier activity on the selected channel. If the selected channel is a Channel Guard channel and the proper Channel Guard value is not detected, the Busy Channel Indicator remains on for the duration of the carrier activity and no message is heard. During Scan and Priority Scan operation, the Busy Channel Indicator glows when activity is detected on any channel on the Scan List.

When scanning or priority scanning Channel Guard channels with the CG (Channel Guard Disable) button OFF and activity has been detected, the Busy Channel Indicator glows for the time period necessary to determine if the proper Channel Guard value has been received. This will cause the Busy Channel Indicator to flash at various rates.

3.16.6.2 BUSY CHANNEL LOCKOUT

The Busy Channel Lockout feature applies only to those channels programmed with a receive Channel Guard value. When carrier activity is detected on the channel selected, the radio checks the receive Channel Guard value. If the proper Channel Guard value is present, the radio can transmit on that channel even if the CG button is off.

If the radio detects an incorrect value or carrier activity only, the transmitter is disabled. If an attempt is made to transmit, an alert tone will be generated and the display will show the word **BUSY** until the channel becomes available or the PTT switch is released, whether the CG button is on or off.

Channels not programmed with a receive Channel Guard value can be used to transmit regardless of carrier activity.

3.16.6.3 BUSY CHANNEL LOCKOUT WITH OVERRIDE

This mode operates in the same manner as Busy Channel Lockout except that the user can override and transmit by pressing the CG button to disable receive Channel Guard (an arrow will appear over the button). The transmitter is locked out only if the CG button is off (no arrow above the CG button).

3.17 ALPHANUMERIC DISPLAY FEATURES

The Alphanumeric Display can be programmed to operate in Numeric Mode, displaying channel numbers instead of labels.

Display annunciators indicate the following information:

ALPHANUMERIC	INDICATION
PR	-Priority Channel
PRG	-Programming Mode
TX	-Transmit
RX	-Receive
SCN	-Scan List Channel -Flashing SCN indicates scanning in progress, and RX SCN indicates receiving on a scanned channel.
ID	-Digital reception/transmission - 'It's Digital' -*Programming Mode* - Automatic Numeric Identification (ANI)
CG	-User Channel Guard Active
GRP	-Group Label
	-Individual Call -Flashing phone icon indicates missed call.

DMH Series mobile radios can be programmed with the following features:

3.17.1 CHANNEL LABELS

You can program the radio with a label for each of the 25 channel groups and a label for each of the 16 channels within each group.

To display the channel number associated with a channel label:

1. Press the microphone's **[#]** key to display the group number.
2. Press the **[#]** key again to display the channel number.
3. Press and hold the **[#]** key to display the channel label.
4. Press the **[ENT]** key or wait for about 5 seconds to revert to normal radio operation.

Each label can include up to eight characters, with decimal points available between characters. Characters can include ***A-Z, 0-9, -, *, $, /, +, %, \, |, _, <, >, h,*** or a blank space.

3.17.2 GROUP LABELS

The display can show group labels in addition to group numbers.

To display a group label, turn scanning functions off, then:

1. Press the microphone's **[#]** key to display the group number.
2. Press and hold the **[#]** key to display the group label.
3. Press the **[ENT]** key or wait for about 5 seconds to revert to normal radio operation.

3.18 DEFINITIONS AND ACRONYMS

ANI	Automatic Numeric Identification
CG	Channel Guard
CLR	Clear
Channel Guard	A subaudible tone, a code (analog) or a Network Access Code (digital) for selective calling and receiving.
DTMF	Dual Tone Multiple Frequency
DTMF Tones	Tones that sound like those used by a standard push-button telephone.
ENT	Enter
FCN	Function
GRP	Group
ID	Digital reception/transmission – '**I**t's **D**igital."
Individual Personality	The information programmed with a PC on both a global and by-channel basis that tells the radio exactly how to operate.
Mixed Mode	Allows Analog and Digital operation on the same channel
NAC	Network Access Code for digital channel.
PR	Priority Channel
PRG	Programming mode
PRI	Priority
PTT	Push-To-Talk
RTA	Repeater Talk Around
RTX Channel	Ready-to-Transmit Channel
RX	Receive
SCN	Scan
SQL	Squelch
Squelch	A control that eliminates background noise.
Talkback Scan	When scanning, if a signal is present, the scan will stop and you will hear the signal. If you then push the PTT switch to talk back to the person, you are in Talkback Scan Mode.
TGID	Talk Group ID
Time-Out Timer	A feature that limits the duration of calls.
TX	Transmit

SECTION IV
THEORY OF OPERATION

4.1 INTRODUCTION

This section contains a description of equipment and a theory of operation for the BK Radio DMH APCO Project 25 digital VHF radio. To aid in understanding the operation of the equipment, schematic diagrams are found in Section VI of this manual.

4.2 EQUIPMENT DESCRIPTION

The BK Radio DMH Series radio comprises the following sub-assemblies:

4.2.1 SYSTEM BOARD

This sub-assembly consists of core microprocessor, synthesizer, voltage regulation and baseband signal processor. A casting is used to shield the synthesizer area.

4.2.2 RX BOARD

This sub-assembly consists of the receiver circuitry from the front-end through the digital IF.

4.2.3 HIGH LEVEL POWER AMPLIFIER BOARD

This sub-assembly consists of the transmitter power amplifier, harmonic filter, antenna switch, directional coupler and power control.

4.2.4 OPTIONS BOARD

This sub-assembly consists of the audio power amp, and interfaces with both the System Board and the Control Board.

4.2.5 CONTROL BOARD

This sub-assembly consists of a control head microprocessor, regulator, and vacuum fluorescent display driver. It interfaces with the front panel.

4.2.6 VCO BOARD

The VCO board is a separate assembly that resides in its own shielded enclosure and interconnects with the System Board and RX Board.

4.3 THEORY OF OPERATION

4.3.1 SYSTEM BOARD

System board functions include:

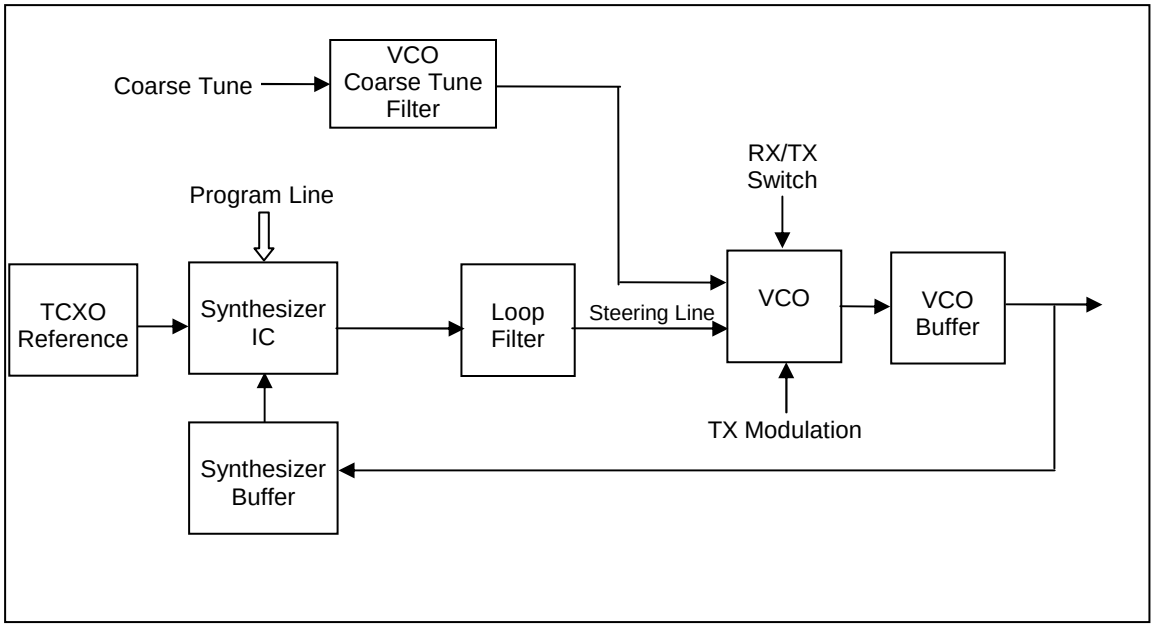
- Core Microprocessor
- Synthesizer
- Voltage Regulators
- Baseband Signal Processor

A. Core Microprocessor

The core microprocessor communicates with the control head microprocessor and the baseband signal processor. It controls radio functions such as adjusting the deviation and receiver tuning. An EEPROM is used to store calibration and tuning data unique to each radio. An internal clock determines the microprocessor's operating frequency.

B. Synthesizer

The Synthesizer generates an RF signal either to down-convert a desired receive frequency to a fixed IF or to drive the Transmitter. The synthesizer locks the RF output frequency of a Voltage Controlled Oscillator (VCO) to a very stable frequency reference.



(1) Synthesizer IC – Contains programmable counters to divide and compare the VCO output frequency to the stable TCXO reference and adjusts VCO control voltage to maintain a stable output frequency.

(2) TCXO Reference – Provides a stable frequency reference over the operating temperature range of the radio.

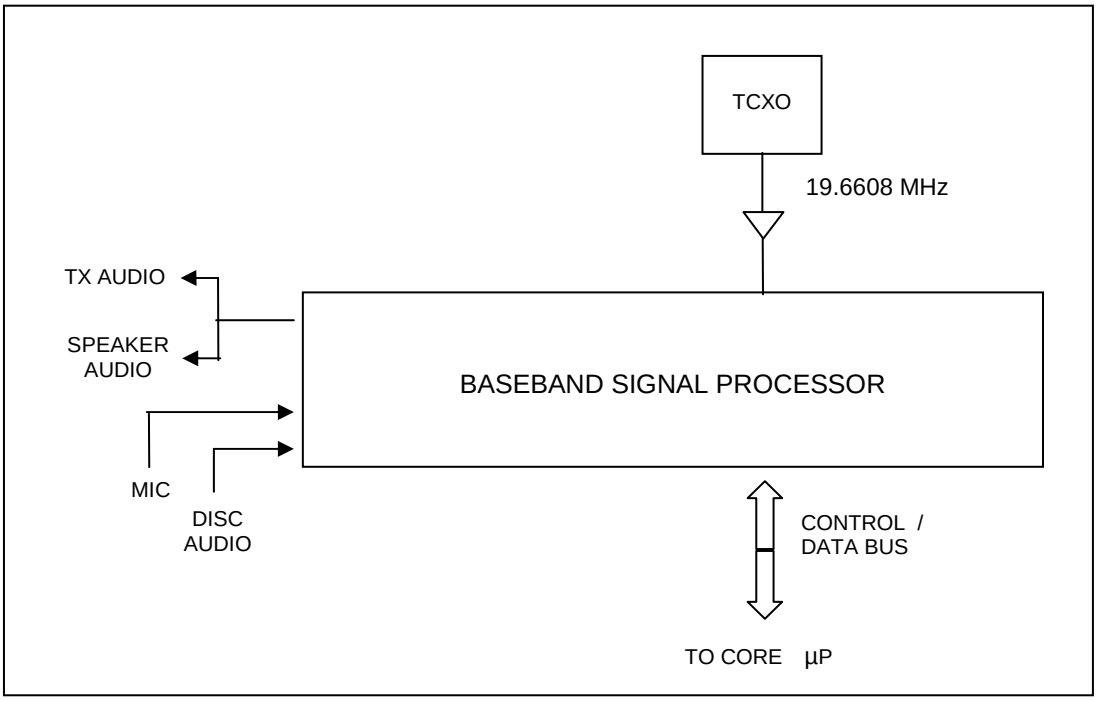
(3) Loop Filter – Smoothes the output of the Synthesizer IC to reduce undesired modulation of the VCO frequency.

(4) VCO Coarse Tune Filter – When changing to a new frequency that requires a different Coarse Tune voltage, a switch is closed for a short time to allow the VCO control voltage to change to the new value rapidly. Otherwise the VCO Coarse Tune Filter provides a low noise voltage for setting the range of the VCO frequency.

C. Voltage Regulators

Several voltage regulators provide power for the circuitry located on the System Board.

D. Baseband Signal Processor



(1) Baseband Signal Processor - Implements filters, tone generators, and other signal processing algorithms required for analog and digital modes of operation.

(2) TCXO – Provides a stable oscillator frequency for the Baseband Signal Processor.

4.3.2 RX BOARD

A. Buffer

Q101 provides gain to supply the mixer and transmit buffer.

B. TX Buffer

Q102 and associated circuitry provide gain to drive the PA module.

C. Front End

The preselectors are varactor-tuned direct coupled filters. The preamp Q7 provides gain to overcome filter losses and provide good noise performance.

D. Front End Tuning

U2 is a digital to analog converter that provides tuning voltages for each of the five varactor elements in the pre-selectors.

E. Mixer/IF

The mixer converts the RF input signal to an intermediate frequency of 16.9 MHz where it is filtered and amplified.

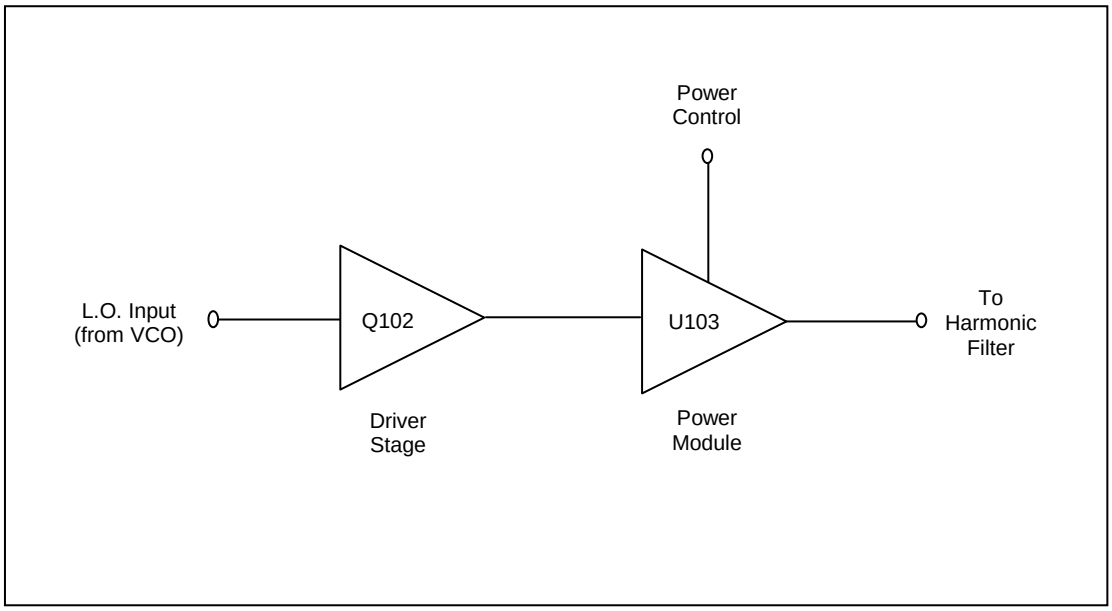
F. IF Amp

Q6 provides gain for the IF signal.

G. IF Processor

U1 further processes the IF signal before application to the Baseband Signal Processor.

4.3.3 HIGH LEVEL PA BOARD



A. Power Amplifier

The high level power amplifier consists of an integrated VHF power module.

B. Harmonic Filter

A filter is used to attenuate transmitter harmonics before they reach the antenna port.

C. Antenna Switch

The antenna switch connects either the power amplifier or the receiver to the antenna. It also provides isolation between the receiver and the power amplifier when the radio is transmitting.

D. Directional Coupler

A directional coupler and associated detectors provide DC voltages proportional to the forward and reflected power at the antenna connector. The voltages are used for power leveling and high VSWR protection.

E. Power Control

The core microprocessor controls the output power of the transmitter by setting the reference voltage of a feedback control loop. The microprocessor sets the value of U510, a digital to analog converter. An output of the U510 sets the reference voltage of the power control loop which consists of U105 and associated circuitry.

4.3.4 OPTIONS BOARD

A. Audio Power Amplifier

U1, U2, U3, U4 and U5 provide audio power amplification to drive the internal and external speakers.

4.3.5 CONTROL BOARD

A. Microprocessor

U101 controls the interface between the radio and the user. During normal operation, U101 monitors the front panel and push-to-talk switches, and provides data to the display. In the radio programming mode, U101 interprets commands from the serial bus and provides a transparent interface to the external programming source.

B. Voltage Regulator

Voltage regulators provide the necessary voltages for the display and microprocessor circuitry.

C. Vacuum Fluorescent Display Driver

The Display Driver provides the necessary drive signals for the vacuum fluorescent display.

4.3.6 VCO BOARD

The VCO is a varactor tuned oscillator. A steering voltage controls the frequency of oscillation. A low sensitivity input for modulation is provided.

The output cascode amplifier provides a nominal drive level of 0 dBm in receive and transmit modes.

SECTION V
MAINTENANCE

5.1 INTRODUCTION

This section contains test and alignment procedures for an operational BK Radio DMH APCO Project 25 digital mobile radio. This section also contains disassembly and assembly procedures. An understanding of the theory of operation is recommended before maintenance is attempted.

5.2 TEST EQUIPMENT REQUIRED

A.	RF Signal Generator	HP8640 or equivalent
B.	Distortion Analyzer	HP334A or equivalent
C.	Power Meter	HP435B with 30 dB pad or equivalent
D.	Service Monitor	HP8920A Service Monitor or equivalent
E.	Digital Multimeter	Fluke 8012A or equivalent
F.	Computer	IBM PC or compatible, with an RS-232 serial port
		LAA 0725 programming cable
		DMH Editor Software
G.	DMH Tool/Cable Kit	LAA 0621, P/N 050-03152-0000

5.3 OVERHAUL

5.3.1 ACCESSORIES

This section contains instructions to assist in determining, by inspection, the condition of DMH assemblies. Defects resulting from wear, physical damage, deterioration, or other causes can be found by these inspection procedures. To aid inspection, detailed procedures are arranged in alphabetical order.

A. Capacitors, Fixed

Inspect capacitors for case damage, body damage, and cracked, broken, or charred insulation. Check for loose, broken, or corroded terminal studs, lugs, or leads. Inspect for loose, broken, or improperly soldered connections. On chip caps be especially alert for hairline cracks in the body and broken terminations.

B. Capacitors, Variable

Inspect trimmers for chipped and cracked bodies, damaged dielectrics, and damaged contacts.

C. Chassis

Inspect the chassis for deformation, dents, punctures, badly worn surfaces, damaged connectors, damaged fastener devices, loose or missing hardware, component corrosion, and damage to the finish.

D. RF Coils

Inspect all RF coils for broken leads, loose mountings, and loose, improperly soldered, or broken terminal connections. Check for crushed, scratched, cut, or charred windings. Inspect the windings, leads, terminals, and connections for corrosion or physical damage. Check for physical damage to forms and tuning slug adjustment screws.

E. Connectors

Inspect connectors for broken parts and other irregularities. Inspect for cracked or broken insulation and for contacts that are broken, deformed, or out of alignment. Also, check for corroded or damaged plating on contacts and for loose, improperly soldered, broken, or corroded terminal connections.

F. Covers and Shields

Inspect covers and shields for punctures, deep dents, and badly worn surfaces. Also, check for damaged fastener devices, corrosion, and damage to finish.

G. Flex Circuits

Inspect flex circuits for punctures and badly worn surfaces. Check for broken traces, especially near the solder contact points.

H. Fuse

Inspect for blown fuse and check for loose solder joints.

I. Insulators

Inspect insulators for evidence of damage, such as broken or chipped edges, burned areas, and presence of foreign matter.

J. Jacks

Inspect all jacks for corrosion, rust, deformations, loose or broken parts, cracked insulation, bad contacts, or other irregularities.

K. Resistors, Fixed

Inspect the fixed resistors for cracked, broken, blistered, or charred bodies and loose, broken, or improperly soldered connections. On chip resistors, be especially alert for hairline cracks in the body and broken terminations.

L. Terminal Connections Soldered

1. Inspect for cold-soldered or resin joints. These joints present a porous or dull, rough appearance. Check for strength of bond using the points of a tool.

2. Examine the terminals for excess solder, protrusions from the joint, pieces adhering to adjacent insulation, and particles lodged between joints, conductors, or other components.

3. Inspect for insufficient solder and unsoldered strands of wire protruding from conductor at the terminal. Check for insulation that is stripped back too far from the terminal.

4. Inspect for corrosion at the terminal.

5.3.2 CLEANING

A. Using a clean, lint-free cloth lightly moistened with soap and water only, remove the foreign matter from the equipment case and unit front panel. Wipe dry using a clean, dry, lint-free cloth.

B. Using a hand controlled dry air jet (not more than 15psi), blow the dust from inaccessible areas. Care should be taken to prevent damage by the air blast.

C. Clean the receptacles and plugs with a hand controlled dry air jet (not more than 25psi), and a clean, lint-free cloth lightly moistened with soap and water only. Wipe dry with a clean, dry, lint-free cloth.

5.3.3 REPAIR

This section describes the procedure along with any special techniques for replacing damaged or defective components.

A. Connectors

When replacing a connector, refer to the appropriate PC board assembly drawing and follow the notes to insure correct mounting and mating of each connector.

B. Crystal

The use of any other than a BK Radio crystal is considered an unauthorized modification.

C. Diodes

Use long nose pliers as a heat sink under normal soldering conditions. Note the diode polarity before removal.

D. Integrated Circuits

Refer to Appendix A for removal and replacement instructions.

E. Wiring/Coaxial Cable

When repairing a wire that has broken from its terminal, remove all old solder and pieces of wire from the terminal, restrip the wire to the necessary length and resolder the wire to the terminal. Replace a damaged wire or coax with one of the same type, size, and length.

5.4 DISASSEMBLY & ASSEMBLY

The DMH radio has three major assemblies which contain the following circuit boards:

- Control Head Assembly (at the front of the radio)
  - Switch Board
  - Control Board
  - Options Board
- Core Assembly (in the extruded housing)
  - System Board
  - RX/TX Board
  - VCO Board
  - PA Flex Circuit
- PA Assembly (in the heatsink casting)
  - Filter Board
  - PA Board
  - Accessory Board

5.4.1 UNIT DISASSEMBLY

A. Remove the four corner screws from the back of the heatsink casting.

B. Carefully pull the heatsink casting from the Core assembly.

C. Disconnect the two flex cables and two coaxial cables from the PA board.

NOTE: The black-end coax is the RX input to the receiver. The white-end coax is the exciter input to the PA.

D. Place both thumbs on the back of the Core assembly and push it out of the extruded housing.

5.4.2 CONTROL HEAD ASSEMBLY

A. Remove the PA Assembly.

B. Remove the 6 flat-head screws around the Control Head housing.

C. Carefully pull the Control Head from the Core assembly.

D. Disconnect the two flex cables from the Options board.

E. Remove the 2 flat-head screws from the audio amplifier and 2 pan-head screws that hold the unit together.

F. Remove the audio heat sink.

G. Remove the Options board.

5.4.2.1 CONTROL BOARD

1. Pull off the two rotary knobs from the front of the radio and remove rubber resistance washer behind volume knobs.

2. Using the spanner tool, remove the nuts holding the rotary switches in place.

   NOTE: The spanner tool (076-01475-0000) has been modified for use with DMH radios. Older spanner tools may not have sufficient depth.

   NOTE: These 2 nuts do not have the same thread pitch and are not interchangeable. During reassembly, replace each nut in its original location.

3. Carefully remove the Control board by prying it up.

   NOTE: During reassembly, check that the microphone jack is seated properly in the housing before tightening the nuts on the rotary switches.

5.4.2.2 DISPLAY BOARD

1. Remove the Control board.

2. Remove the flat spring clip by prying the end with the tab toward the top of the housing.

3. Lift out the Display board.

   NOTE: During reassembly, check that the flex cable does not block the display by folding between the display and window.

5.4.2.3 PUSHBUTTON LABELS

1. Pull out a pushbutton from the front of the radio.

2. Remove the old label by pushing from the back.

3. Insert the new label.

4. Insert the pushbutton in its original location.

5.4.2.4 RECONNECT CONTROL HEAD

1. Attach flex cables before placing control head onto the Core assembly.

2. Check that coax cables are not on the lid of the harmonic filter.

3. Attach control head to Core assembly with 6 flat-head screws.

   NOTE: Use care to prevent breaking the 6 Control Head tabs when tightening the flat-head screws.

5.4.3 CORE ASSEMBLY

5.4.3.1 VCO AND RX/TX BOARDS

1. Remove the sheet metal shield from the RX/TX board by prying it up with a flat-blade screwdriver.

2. Remove the 4 screws from the VCO cover and lift off the VCO cover.

3. Carefully remove the VCO by lifting it from the center or prying it up evenly around the sides.

4. Remove the 7 screws from the RX/TX board, pull both coax leads (one at a time) through the ferrite bead, and carefully lift out the RX/TX board.

5.4.3.2 VCO AND RX/TX REASSEMBLY

1. Insert the RX/TX board into the housing, pulling the two coax cables through the hole in the housing. Pull the coaxes snug and make certain they clear the 12-pin connector between the RX/TX board and the System board. Thread each coax through the ferrite bead.

   NOTE: Check that connectors are properly aligned with the System board before seating them firmly.

2. Insert the VCO, using care to not bend the pins.

3. Attach the VCO cover and snug down the screws.

4. Fasten the RX/TX board to the housing with the seven screws.

5. Insert the flex cables.

5.4.3.3 SYSTEM BOARD

1. Remove the 4 screws and lift off the synthesizer cover.

2. Remove the 3 screws from the System board.

3. Disconnect the front flex cable.

4. Lift out the System board by lifting the front of the board first, then pulling the back flex through the casting.

5.4.3.4 SYSTEM BOARD REASSEMBLY

1. Insert the System board in the housing, carefully threading the back flex through the casting.

2. Attach the Synthesizer cover with the 4 screws. Insure that the rubber tubing is in the cavity above the large rectangular capacitor C119.

   NOTE: When reassembling the Synthesizer and VCO, snug down the screws on the covers or malfunctions may occur.

3. Attach the System board with the 3 screws.

4. Insert the other flex cable.

5.4.4 PA ASSEMBLY

A. Using a 7/16" deepwell socket, remove the hex nut from the antenna connector on the back of the heatsink housing.

B. Remove the 13 screws from the PA board.

C. Remove the PA board from the heatsink housing by pushing the power connector and antenna connector.

D. Remove the Accessory board by removing the one screw on the back.

NOTE: During reassembly, press the heatsink housing evenly against the Core assembly while inserting the 4 screws. Tighten screws at diagonal corners to seat the heatsink housing firmly. Install the remaining screws.

5.4.5 UNIT ASSEMBLY

To assemble the unit, complete the disassembly procedure in reverse order.

5.5 ALIGNMENT PROCEDURES

The DMH radio uses all electronic tuning with no manual adjustments. Use the DMH Editor software when alignment or adjustment is required. You will need an IBM or compatible computer with a disk drive and an RS-232 serial port. You will also need the DMH Editor software (LAA0742CD) and an RS-232 interface cable (LAA0725), available from BK Radio.

5.5.1 TEST SETUP

Mount the radio in a suitable fixture containing an adapter for supplying 13.8 VDC from a negative ground power supply. Turn off any radio features assigned to the microphone keypad function menu and set the manual controls as follows:

Channel Selector:	Channel 1
On/Off Volume:	On, volume minimum

5.5.2 ALIGNMENT ORDER

When more than one procedure is necessary, follow the order listed:

A. Synthesizer Calibration

B. Reference Oscillator Frequency

C. Transmit Power Curve

D. Transmit Power Adjustment

E. VCO Modulation Sensitivity

F. Receiver Tuning

G. Squelch Adjust

A. Synthesizer Calibration

This calibration records the required VCO pretuning voltage across the RF frequency band. This adjustment may be necessary if VCO components are replaced.

No additional setup is required for this procedure.

During the automatic calibration, the synthesizer will attempt to acquire several receive and transmit frequencies. For each test frequency, the pretune D/A converter voltage will be varied to determine the optimum value. The LCKDTECT signal is monitored to determine if synthesizer lock occurs. The D/A voltages that result in proper operation will be recorded in the radio's EEPROM memory.

B. Reference Oscillator Frequency

This procedure allows the reference TCXO frequency to be corrected. Transmit and receive frequencies are derived from the reference oscillator. The reference oscillator may require adjustment due to crystal aging or if the reference oscillator module is replaced.

To set up for this procedure, connect a suitable attenuator and frequency counter to the antenna output of the radio. The attenuator must be capable of handling the full power output of the radio and protecting the input of the frequency counter. A 30 dB attenuator capable of 50 Watts is recommended.

Transmit frequency must be measured and entered into the alignment software. Once these frequencies are obtained, proper settings for Frequency Adjustment are automatically computed and recorded in the radio's EEPROM memory.

C. Transmit Power Curve

NOTE: The transmitter should not be keyed for extended periods while setting transmitter power. Prolonged transmitting will cause the thermal protection circuitry of the radio to decrease the transmitter power.

This setting is used to help maintain a constant transmitter output power of 50 Watts across the RF frequency band. If components on the PA board are replaced, this adjustment may be necessary.

To set up for this procedure, connect a suitable 50Ω power meter to the antenna output of the radio.

Output power must be observed while interactively adjusting the power at several frequencies. The final settings are recorded in the radio's EEPROM memory.

D. Transmit Power Adjustment

NOTE: The transmitter should not be keyed for extended periods while setting transmitter power. Prolonged transmitting will cause the thermal protection circuitry of the radio to decrease the transmitter power.

This setting allows customization of transmit high and low power output levels. If components in the transmitter power circuit are replaced, this procedure may be necessary.

To set up for this procedure, connect a suitable 50Ω power meter to the antenna output of the radio.

Output power must be observed while interactively adjusting the power. The final setting is recorded in the radio's EEPROM memory.

E. VCO Modulation Sensitivity

This adjustment controls the maximum analog and digital mode FM deviation of the transmitter. If components in the VCO or Transmit Audio amplifier or filter are changed this adjustment may be necessary to maintain an FM deviation below 5 kHz (2.5 kHz for narrowband or digital mode).

To set up for this procedure, connect a suitable attenuator and service monitor to the antenna output of the radio. Disconnect any modulation source from the MIC HIGH input of the radio. Configure the service monitor to read peak FM deviation.

Follow the software instructions for each alignment frequency. Observe the service monitor reading while interactively adjusting the peak FM deviation to 3.0 kHz. The final settings are recorded in the radio's EEPROM memory.

F. Tune Receiver

Varactor controlled bandpass filters in the receiver front end provide spurious response rejection. If components in the bandpass filters, RF amplifier, or mixer are replaced this adjustment may be necessary to maintain specified RF sensitivity.

To set up for this procedure, connect an RF signal generator to the radio antenna input. Set the generator FM modulation to a frequency of 1 kHz and a deviation of ±3 kHz. Connect a SINAD meter to the radio audio output.

For each alignment frequency, retune the RF signal generator and adjust the generator output level to obtain a SINAD reading of approximately 12 dB. Optimize reception at each frequency by interactively adjusting the varactor voltages to obtain the greatest SINAD reading. If necessary reduce the signal generator level to maintain a SINAD reading between 12 and 18 dB. The final settings are recorded in the radio's EEPROM memory.

G. Squelch Adjust

With preset squelch the DMH audio should turn on at approximately 12 dB SINAD. If components in the receiver IF or squelch filter are replaced, adjustment of the squelch may be necessary.

To set up for this procedure, connect an RF signal generator to the radio antenna input. Set the generator FM modulation to a frequency of 1 kHz and a deviation of ±3 kHz for wide band squelch adjustment, or ±1.5 kHz for narrow band squelch adjustment.

For both wide and narrow mode, set the signal generator modulation and adjust the output level to obtain a SINAD reading of approximately 8 dB. The proper setting for Squelch Adjust is automatically computed and recorded in the radio's EEPROM memory.

SECTION VI
ILLUSTRATED PARTS LIST

6.1 INTRODUCTION

This section helps you identify parts used in BK Radio's DMH Series mobile radio. It includes Replacement Parts Lists for all major assemblies arranged from the Final Assembly down to an individual part level. Each List is followed by the corresponding Assembly Drawing (if required), Parts Placement Drawing, and Schematic Diagram.

Parts itemized in the various lists meet BK Radio's design specifications and are the recommended replacement parts.

6.2 PARTS LIST DESCRIPTION

Replacement Parts Lists contain specific information on each part in the corresponding Assembly Drawing and Schematic Diagram. Sub-assemblies are also listed by a part number, helping you find the correct sub-assembly parts. Each part and Sub-assembly has a 12-digit number that is unique. Parts are usually identified by their schematic reference number or, in the case of an assembly, their item number.

6.3 ASSEMBLY DRAWING SYMBOLS

Several symbols are used in the Assembly Drawings. One symbol helps to identify parts (or items) that are listed in the Drawing's corresponding Parts List. Another symbol references a specific Note that is on the Drawing. The symbols are (with examples):

(32)	—	refers to Item 32 in the Replacement Parts Lists
ITM 32	—	also refers to Item 32 in the Replacement Parts Lists
△6	—	refers to Drawing's Note No. 6
L1	—	refers to Part L1 (also its Schematic Reference No.)
J14	—	refers to Part J14 (also its Schematic Reference No.)
2REQ'D	—	indicates two of the Items are required in the Assembly

Table 6-1. Replacement Parts, Final Assembly - Dash Mount

Item Reference Number	Part Number	Description
ASY 1	7011-30963-900	DMH_PA_Bd_Heatsink_Assy
ASY 2	7010-30966-000	Mob,Digtl.VHF,15/50W,400Ch,136-174_CORE
ASY 3	7011-30964-800	DMH,DASHMOUNT CTRL HEAD ASSY
ITM 1	1409-40004-003	Extrusion, Wrap, Housing
ITM 2	1400-40002-001	Bracket, Mtg Channel (QTY 2)
ITM 3	2512-40002-800	Gasket, Cont, HD/PA, (QTY 2)
ITM 4	2804-20019-600	Scr,MS,6-32,X1_7/16,P,PH,SS,BLKOX, (QTY 4)
ITM 5	6008-20015-800	Cable, Flex Jumper Assy., 12-Cond, 2A, L=3 (Qty 2.0) (J509 Sys. To J509 Option Bd.) (J508 Sys. To J102 PA Bd.)
ITM 6	6008-20015-803	Cable, Flex Jumper Assy.,16-Cond, 2A, L=8.6 (Option J15 to J15 Accessory Bd)
ITM 7	2803-00250-045	Scr,MS,4-40,X1/4,P,FH100,N, (QTY 6)
ITM 8	2507-30923-801	Label,1.89"x0.79",Brady,B428,Mtl_Poly
ITM 9	2540-20019-732	Finger stock, 5.25In (QTY 2 - front of PA heat sink, top & bottom)
ITM 10	2540-20019-855	Finger stock, 90D (front of chassis top & bottom) (QTY 2)
ITM 11	2508-20016-201	Shield,Tape,T,EM,9116X2
ITM 12	3104-20020-100	Foam,Black

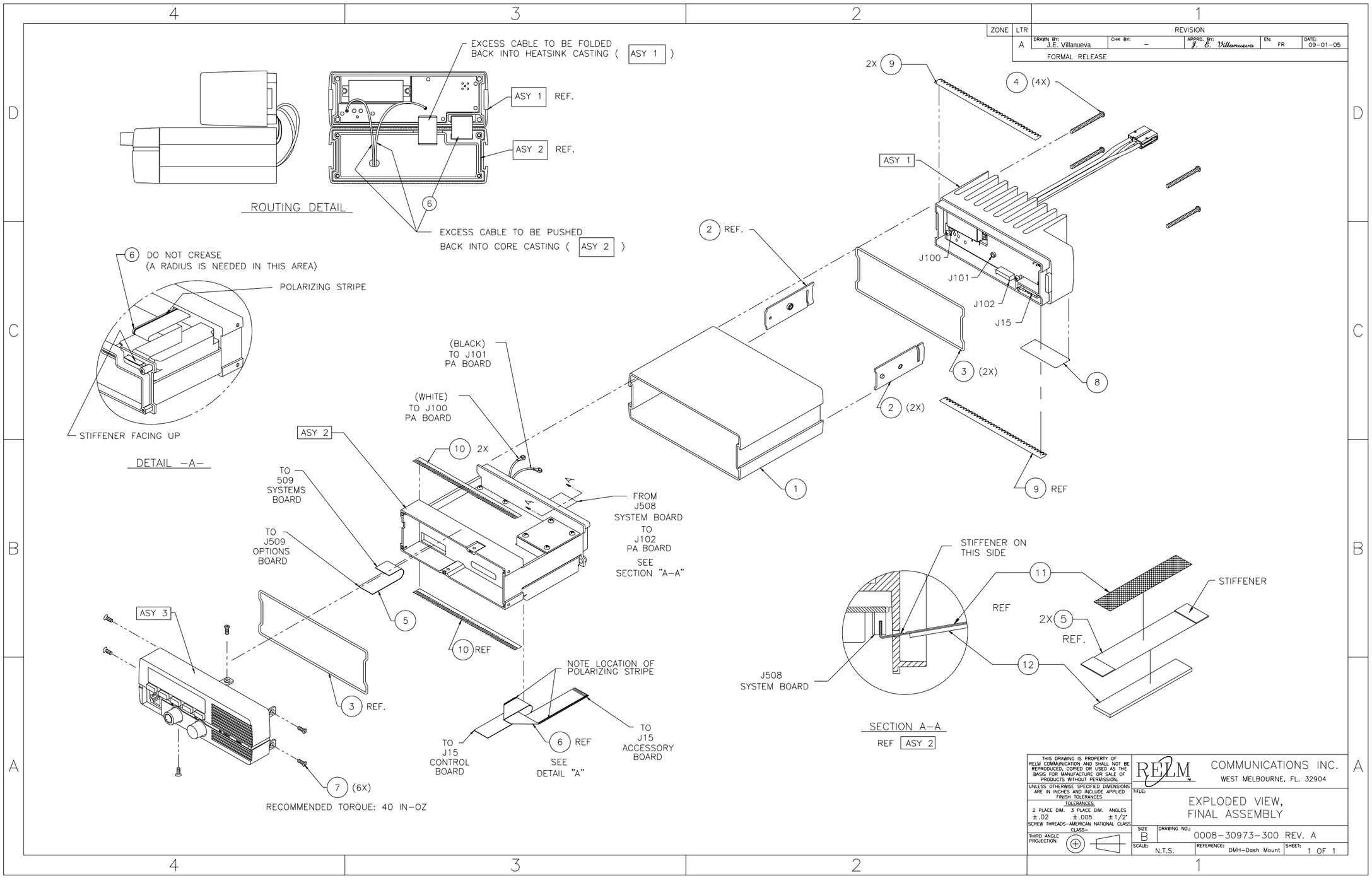


Figure 6-1 Final Assembly – Dash Mount

Table 6-2. Replacement Parts, Final Assembly – Remote Mount RF Unit

RESERVED

RESERVED

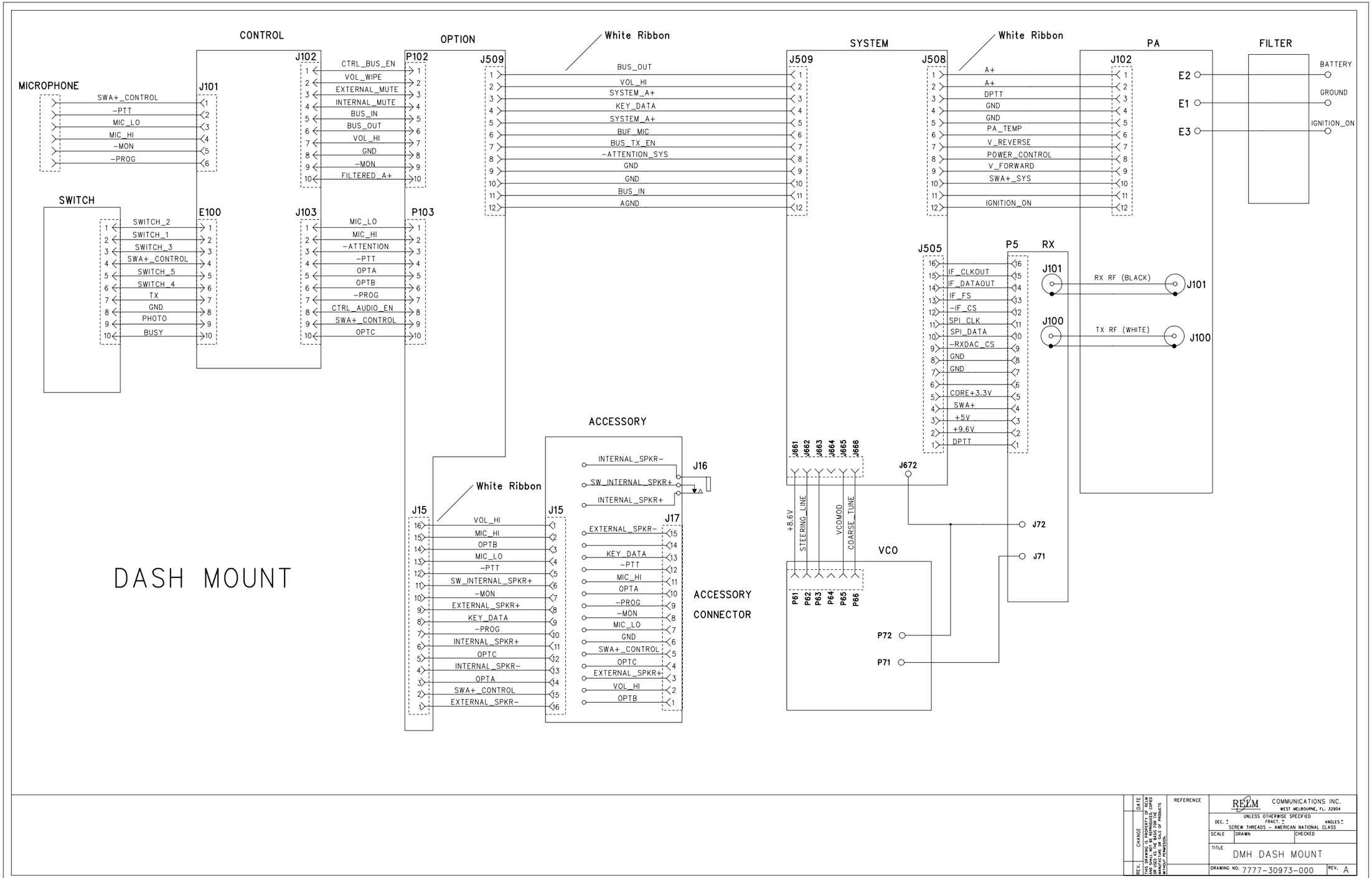


Figure 6-3 Interconnect Diagram – Dash Mount

RESERVED

Table 6-3. Replacement Parts, Control Head Assembly - Dash Mount

Item Reference Number	Part Number	Description
ASY 1	7031-20097-600	EMH/GMH_Switch_Bd_Auto-SMD
ASY 2	7031-30957-700	DMH,Option Bd, Auto-SMD/Pts
ASY 3	7031-30964-800	DMH,Cont_Bd_SMD/Pts
ITM 1	1411-20016-912	Housing Assy,Enhanced Button Design
ITM 2	2001-30926-701	Keypad,E&G_Mobile
ITM 3	2830-60702-501	Clip,PCB_Holdown,
ITM 4	2858-20003-401	Nut,Slot,1/4-40,
ITM 5	1301-20034-800	Speaker,16_OHM, 8W,50MM
ITM 6	6024-30315-826	Wire,Strnd,24GA,250V,Blk-Teflon
ITM 7	6024-30315-826	Wire,Strnd,24GA,250V,Blk-Teflon
ITM 8	2830-20016-300	Clip,Spkr (QTY 4)
ITM 9	2402-30971-402	Knob,Channel Select, DMH
ITM 10	2004-30925-501	Keycaps, Set, EM/GM Series
ITM 11	2509-20016-710	Decal, Mobile Logo, DMH
ITM 12	2807-30298-012	Scr,SIMMS,2-56,X7/8,P,PH,ST,CAD/ZN (QTY 2)
ITM 13	2402-30971-401	Knob, Power Vol., DMH

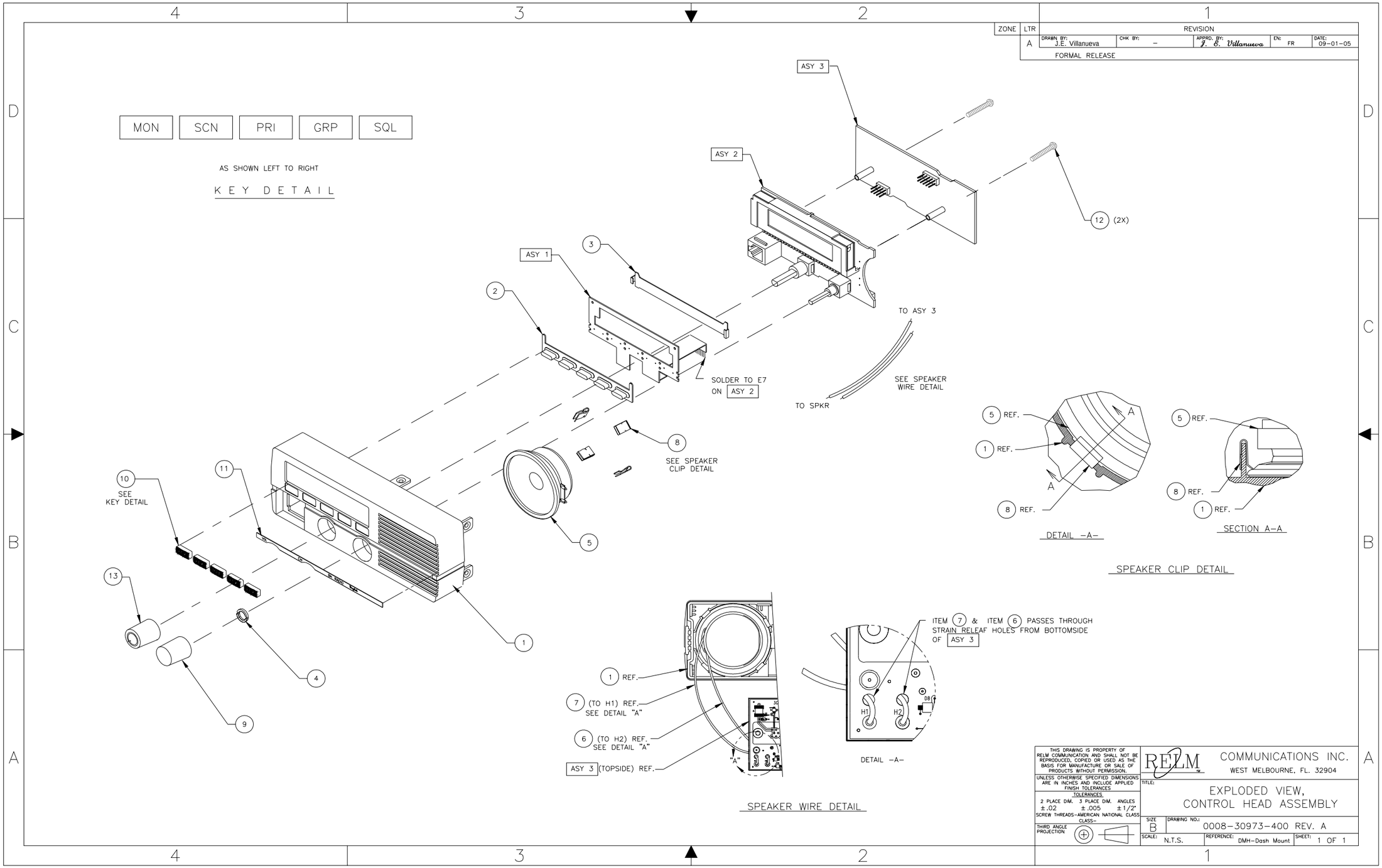


Figure 6-5 Control Head Assembly – Dash Mount

Table 6-4. Replacement Parts, Control Head Assembly - Remote Mount

RESERVED

RESERVED

Table 6-5. Replacement Parts, Control Board (309-648, Rev. C)

Item Reference Number	Part Number	Description
ITM 1	1700-30964-800	PCB,DMH CONTROL BD.
ITM 2	2005-20018-800	Disp,VF,EMH/EMV,
ITM 3	1411-50701-300	Cushion,Mount-VFD,Molded,EM,
B101	2503-02102-410	Bead,Ferrite,1K_Ohm,100MHz,0.1A,0603
B102	2503-02102-410	Bead,Ferrite,1K_Ohm,100MHz,0.1A,0603
B103	2503-02102-410	Bead,Ferrite,1K_Ohm,100MHz,0.1A,0603
C101	1570-03102-273	Cap,Cp,1000pF,X7R,10%,50V,0402
C102	1570-03102-273	Cap,Cp,1000pF,X7R,10%,50V,0402
C103	1570-03102-273	Cap,Cp,1000pF,X7R,10%,50V,0402
C104	1570-03102-273	Cap,Cp,1000pF,X7R,10%,50V,0402
C105	1570-03102-273	Cap,Cp,1000pF,X7R,10%,50V,0402
C106	1570-03102-273	Cap,Cp,1000pF,X7R,10%,50V,0402
C107	1570-00104-272	Cap,Cp,.1uF,10%,X7R,25V,0603
C108	1570-03103-261	Cap,Cp,.01uF,5%,X7R,16V,0402
C109	1570-03103-261	Cap,Cp,.01uF,5%,X7R,16V,0402
C110	1570-03103-261	Cap,Cp,.01uF,5%,X7R,16V,0402
C111	1570-03102-273	Cap,Cp,1000pF,X7R,10%,50V,0402
C112	1552-60463-169	Cap,Tant,15uF,10%,25V,6032
C113	1570-00104-272	Cap,Cp,.1uF,10%,X7R,25V,0603
C114	1570-03222-273	Cap,CP,2200pF,X7R,10%,50V,0402
C115	1570-03102-273	Cap,Cp,1000pF,X7R,10%,50V,0402
C116	1569-30526-418	Cap,E,SMD,47uF,20%,50V,6.3x7.7
C117	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C118	1570-03103-261	Cap,Cp,.01uF,5%,X7R,16V,0402
C119	1570-03102-273	Cap,Cp,1000pF,X7R,10%,50V,0402
C120	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C121	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C122	1570-03102-273	Cap,Cp,1000pF,X7R,10%,50V,0402
C123	1570-03102-273	Cap,Cp,1000pF,X7R,10%,50V,0402
C124	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402

Item Reference Number	Part Number	Description
C125	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C126	1570-03102-273	Cap,Cp,1000pF,X7R,10%,50V,0402
C127	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C128	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C129	1570-03102-273	Cap,Cp,1000pF,X7R,10%,50V,0402
C130	1570-03102-273	Cap,Cp,1000pF,X7R,10%,50V,0402
C131	1570-00105-777	Cp,Cap,1uF,X5R,10%,10V,0603
C132	1570-03102-273	Cap,Cp,1000pF,X7R,10%,50V,0402
C133	1570-03102-273	Cap,Cp,1000pF,X7R,10%,50V,0402
C134	1570-03102-273	Cap,Cp,1000pF,X7R,10%,50V,0402
C135	1570-03102-273	Cap,Cp,1000pF,X7R,10%,50V,0402
C136	1570-03102-273	Cap,Cp,1000pF,X7R,10%,50V,0402
C137	1570-03102-273	Cap,Cp,1000pF,X7R,10%,50V,0402
C139	1570-03102-273	Cap,Cp,1000pF,X7R,10%,50V,0402
C141	1570-03102-273	Cap,Cp,1000pF,X7R,10%,50V,0402
C142	1570-03223-771	Cap,Cp,0.022uF,X5R,10%,16V,0402
C145	1570-03270-163	Cap,CP,27pF,NPO,5%,50V,0402
C170	1552-60463-124	Cap,Cp_Tant,4.7uF,20%,10V,80D,3216,
C171	1570-03102-273	Cap,Cp,1000pF,X7R,10%,50V,0402
CR101	4824-20009-400	Di,Sil,Switching,MMBD60501,SOT-23,
CR102	4828-30512-403	Di,Znr,3.3V,MMBZ5226,SOT-23
CR103	4824-20009-400	Di,Sil,Switching,MMBD60501,SOT-23,
CR104	4828-30512-406	Di,Znr,6.8V,MMBZ5235,SOT-23,
DP100	2005-20018-800	Disp,VF,EMH/EMV,
J101	2105-20004-100	Conn,Mic,6_Pin,
J102	2105-20017-705	Conn,Hdr,Dbl_Row,2X5
J103	2105-20017-705	Conn,Hdr,Dbl_Row,2X5
L101	1808-20042-428	Ind,Fxd_Coil,270UH@796kHz,Q=20,SMD
P104	2105-30910-101	Conn,Male,TSW-103-08-G-D-RA

Item Reference Number	Part Number	Description
Q101	4823-30513-210	Xstr,PNP,Switching,SMBT2907A,SOT-23
Q105	4823-30680-102	Xstr,Dig,NPN,47K/47K,SC-70
Q115	4823-30680-104	Xstr,Dig,NPN,22K/22K,SC-70
R101	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R102	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R103	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R104	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R105	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R106	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R107	4750-30967-701	Res,Var,10K_Ohm,Detent,A Taper,SPST SW
R108	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R109	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R110	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R111	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R112	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R113	4734-03321-311	Res,Cp,3.32 K,1/16W,1%,0402
R114	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R115	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R116	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R117	4734-01003-311	Res,CP,100K,1%,1/16W,0402
R118	4734-01003-311	Res,CP,100K,1%,1/16W,0402
R119	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R120	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R121	4734-02001-311	Res,CP,2K,1%,1/16W,0402
R122	4734-02213-311	Res,Cp,221K,1/16W,1%,0402
R123	4734-01002-311	Res,CP,10K,1%,1/16W,0402
R125	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R126	4734-02211-311	Res,Cp,2.21K,1/16W,1%,0402
R127	4728-00010-334	Res,Cp,1_Ohm,5%,1/8W
R128	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R129	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R130	4734-01000-311	Res,Cp,100_ohm,1%,1/16W,0402

Item Reference Number	Part Number	Description
R131	4734-01000-311	Res,Cp,100_ohm,1%,1/16W,0402
R132	4734-02002-311	Res,Cp,20K,1%,1/16W,0402
R133	4734-01782-311	Res,Cp,17.8K,1/16W,1%,0402
R134	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R135	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R136	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R137	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R138	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R139	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R140	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R145	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R148	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R149	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R150	4734-01000-311	Res,Cp,100_ohm,1%,1/16W,0402
R151	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R152	4734-02212-311	Res,CP,22.1K,1%,1/16W,0402
R155	4734-03013-311	Res,Cp,301K,1%,1/16W,0402
R187	4734-01693-311	Res,Cp,169k,1/16W,1%,0402
R188	4734-01002-311	Res,CP,10K,1%,1/16W,0402
R189	4734-01002-311	Res,CP,10K,1%,1/16W,0402
S101	5110-30910-601	Switch,Poly,SMD-020,
S102	5111-30942-502	SW, Rot, 16 Pos, Gry Code, BV17272
T100	5611-30936-201	Transformer,Coiltronics,VP1-0190,SMD
U101	3134-20082-400	IC,MCU,MC9S08GT60CFB,QFB
U102	3134-20040-101	IC,CTRL_Driver,VFD,NJU3426,QFP48-P1
U103	3134-30950-501	IC,P-Ch,30V,PwrTrench,FDS6679,S0-8
U105	3134-20040-400	Ic,RGV,LM3578,SO8,
U106	4828-30513-102	Di,ESD_EMI,STF701,SC70-5L
U107	4828-30513-102	Di,ESD_EMI,STF701,SC70-5L
U114	3134-30670-403	IC,RGA,LP2951CM,SO8,
U115	3134-30670-700	IC,Analog_Sw,SPST,FSA66,SOT23-5

REV	VER	REVISION				
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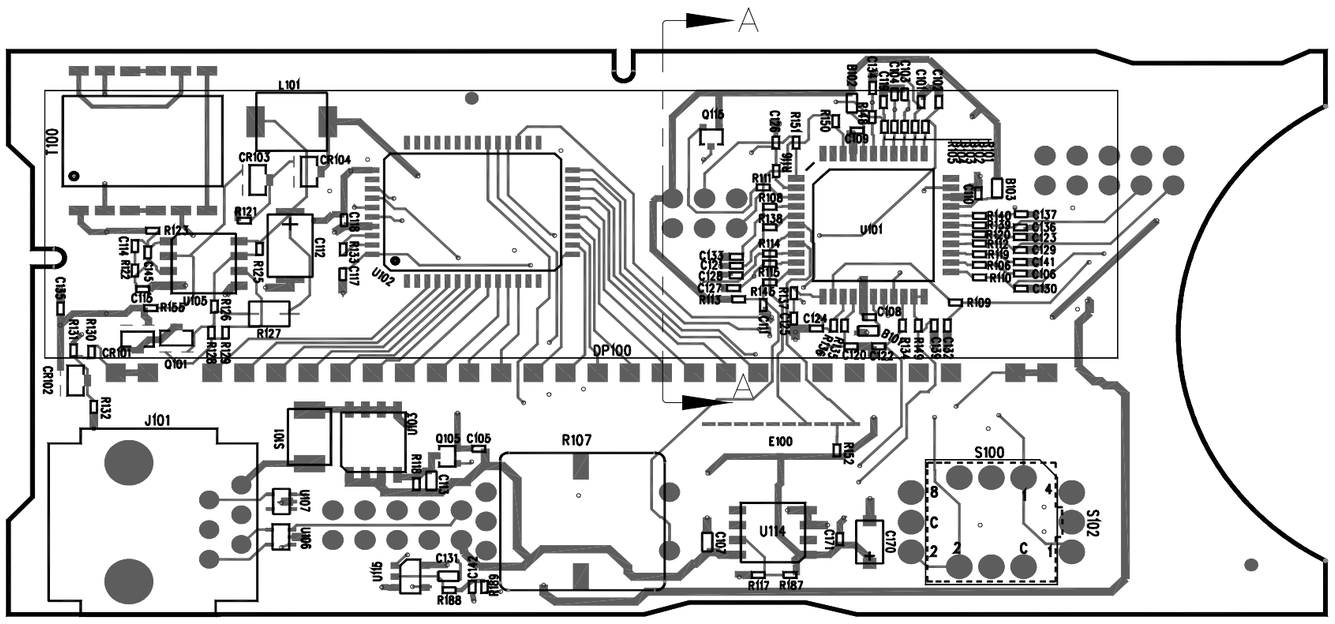
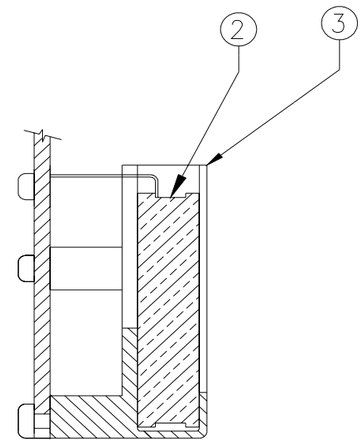


TOP SIDE



SECTION A–A

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND INCLUDE APPLIED FINISH TOLERANCES.

TOLERANCES:
2 PLACE DIM. ±.02 3 PLACE DIM. ±.005 ANGLES ±1/2°
SCREW THREADS–AMERICAN NATIONAL CLASS–
CLASS–

THIRD ANGLE PROJECTION

RELM COMMUNICATIONS INC.
WEST MELBOURNE, FL. 32904

TITLE: PARTS PLACEMENT, CONTROL BOARD, DMH

SIZE: B | DRAWING NO.: 8888-30964-800

SCALE: 2.500 | REFERENCE: DMH-Dash Mount | SHEET: 1 OF 2

Figure 6-7.1 Control Board (309-648, Rev C)

[Sheet 1 – Top Side]

REV	VER	REVISION				
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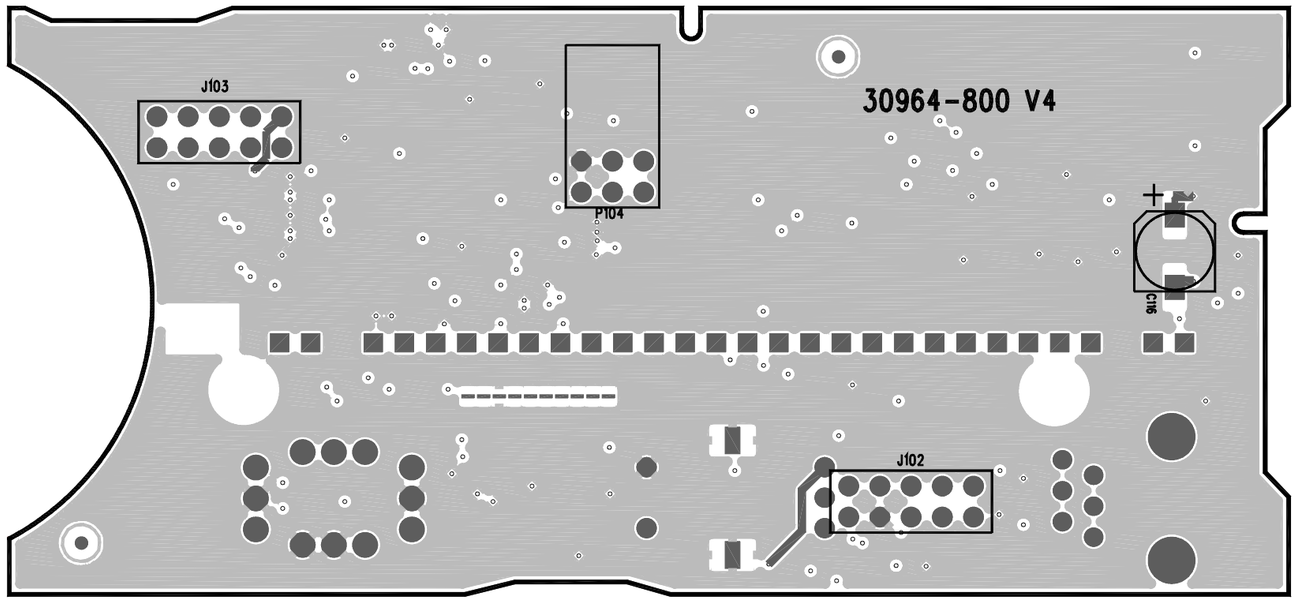


BOTTOM SIDE

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND INCLUDE APPLIED FINISH TOLERANCES

TOLERANCES:
2 PLACE DIM. ±.02 | 3 PLACE DIM. ±.005 | ANGLES ±1/2°
SCREW THREADS-AMERICAN NATIONAL CLASS CLASS-

THIRD ANGLE PROJECTION

RELM COMMUNICATIONS INC.
WEST MELBOURNE, FL. 32904

TITLE: PARTS PLACEMENT, CONTROL BOARD, DMH

SIZE: B | DRAWING NO.: 8888-30964-800

SCALE: 2.500 | REFERENCE: DMH-Dash Mount | SHEET: 2 OF 2

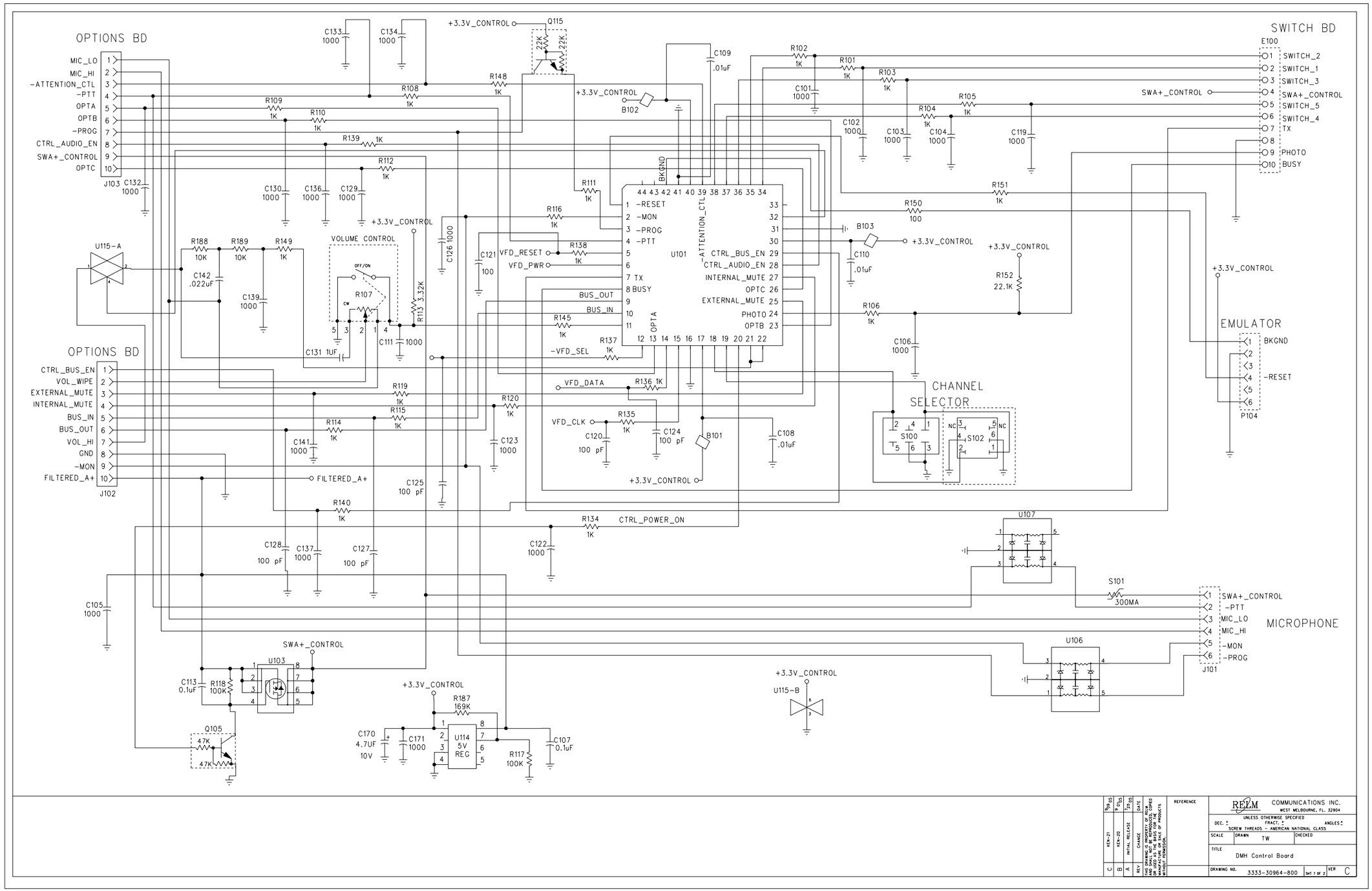
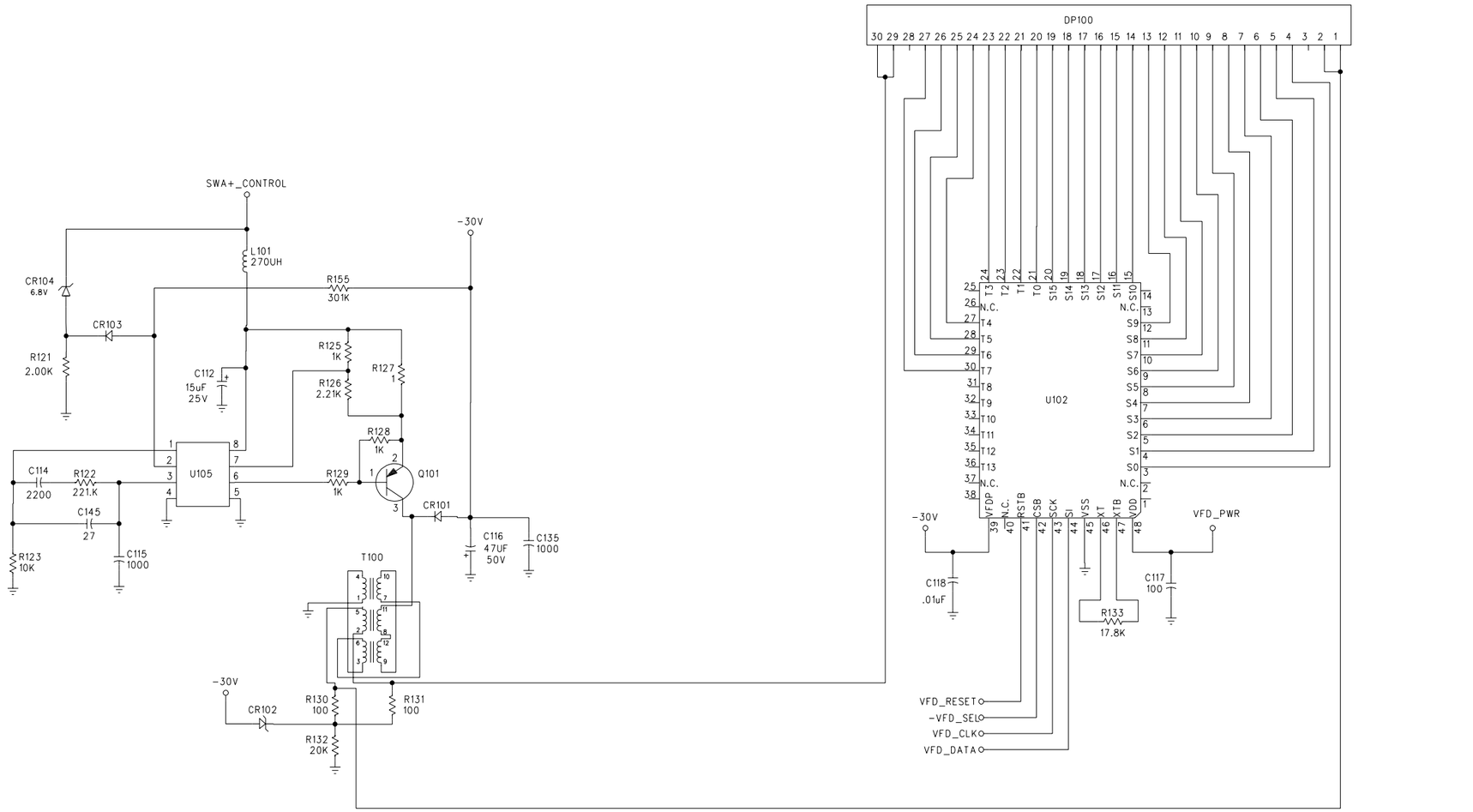


Figure 6-8.1 Control Board Schematic

[Sheet 1]



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UNLESS OTHERWISE SPECIFIED
DEC. ± FRACT. ± ANGLES ±
SCREW THREADS - AMERICAN NATIONAL CLASS

SCALE	DRAWN	CHECKED
	TW	

TITLE: DMH CONTROL BOARD

DRAWING NO. 3333-30964-800 VER SHT2OF2 C

Table 6-6. Replacement Parts, Options Board (309-577 Rev. C) – Dash Mount

Item Reference Number	Part Number	Description
ITM 1	2800-20019-000	Spacer,.096X.55 (Fastened to PCB)
ITM 2	1700-30957-700	PCB,DMH,Option,Bd.
B5	2503-20022-200	Ferrite,Bead,Surfc,Mt
B6	2503-02121-505	Bead,Fer.,120_OHMS@100MHz,200ma,0402
B7	2503-02121-505	Bead,Fer.,120_OHMS@100MHz,200ma,0402
B8	2503-20022-300	Ferrite,Bead,Surfc,Mt
B803	2503-20022-200	Ferrite,Bead,Surfc,Mt
B804	2503-20022-200	Ferrite,Bead,Surfc,Mt
C1	1570-00105-777	Cp,Cap,1Uf,X5R,10%,10V,0603
C2	1570-03102-271	Cap,CP,1000pf,10%,X7R,10V,0402
C3	1552-60463-166	Cap,Tant,68uf,20%,25V,LowESR,7343H
C6	1570-03331-162	Cap,Cp,330 PF,NPO,5%,25V,0402
C7	1570-00104-272	Cap,Cp,.1uF,10%,X7R,25V,0603
C8	1570-00104-272	Cap,Cp,.1uF,10%,X7R,25V,0603
C9	1552-60463-156	Cap,Tant,4.7uF,10%,25V,3528
C10	1552-60463-166	Cap,Tant,68uf,20%,25V,LowESR,7343H
C11	1570-03331-162	Cap,Cp,330 PF,NPO,5%,25V,0402
C12	1552-60463-156	Cap,Tant,4.7uF,10%,25V,3528
C15	1570-03221-163	Cap,Cp,220PF,NPO,5%,50V,0402
C16	1570-03221-163	Cap,Cp,220PF,NPO,5%,50V,0402
C17	1570-03221-163	Cap,Cp,220PF,NPO,5%,50V,0402
C18	1570-03221-163	Cap,Cp,220PF,NPO,5%,50V,0402
C19	1570-01474-271	Cap,Cp,0.47UF,10%,X7R,16V,0805
C20	1570-01474-271	Cap,Cp,0.47UF,10%,X7R,16V,0805
C21	1570-01474-271	Cap,Cp,0.47UF,10%,X7R,16V,0805
C22	1570-01474-271	Cap,Cp,0.47UF,10%,X7R,16V,0805
C23	1570-03104-777	Cap,Cp,0.1uF,10%,X5R,10V,0402
C27	1570-03104-777	Cap,Cp,0.1uF,10%,X5R,10V,0402
C28	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C29	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C30	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402

Item Reference Number	Part Number	Description
C31	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C32	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C33	1570-03104-777	Cap,Cp,0.1uF,10%,X5R,10V,0402
C34	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C35	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C36	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C37	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C38	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C39	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C40	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C41	1570-03180-163	Cap,Cp,18PF,5%,NPO,50V,0402
C42	1570-03151-162	Cp,Cap,150 PF,NPO,5%,0402
C43	1552-60463-161	Cap,Tant,1uF,+/-10%,10V,2012
C44	1570-03104-777	Cap,Cp,0.1uF,10%,X5R,10V,0402
C45	1570-03104-777	Cap,Cp,0.1uF,10%,X5R,10V,0402
C46	1570-03104-777	Cap,Cp,0.1uF,10%,X5R,10V,0402
C47	1570-03180-163	Cap,Cp,18PF,5%,NPO,50V,0402
C48	1570-03151-162	Cp,Cap,150 PF,NPO,5%,0402
C50	1570-01104-273	Cap,Cp,.1uF,10%,X7R,50V,0805
C51	1570-04226-281	Cap,Cp,22uF,20%,X7R,16V,1210
C53	1570-00105-777	Cp,Cap,1uF,X5R,10%,10V,0603
D1	4828-30513-100	Di,ESD_SD05C,SOD-323
D5	4828-30513-100	Di,ESD_SD05C,SOD-323
D6	4828-30513-100	Di,ESD_SD05C,SOD-323
D7	4828-30513-100	Di,ESD_SD05C,SOD-323
D8	4828-30513-100	Di,ESD_SD05C,SOD-323
D9	4828-30513-100	Di,ESD_SD05C,SOD-323
D10	4828-30513-100	Di,ESD_SD05C,SOD-323
J15	2105-20018-116	Conn,Flex_Circuit,16_Cond
J509	2105-20018-112	Conn,Flex_Circuit,12_Cond
L1	1812-68915-261	Ind,Fxd,Pwr,6.8uH,20%,DO1813P-682HC

Item Reference Number	Part Number	Description
L2	1812-68915-261	Ind,Fxd,Pwr,6.8uH,20%,DO1813P-682HC
L3	1812-68915-261	Ind,Fxd,Pwr,6.8uH,20%,DO1813P-682HC
L4	1812-68915-261	Ind,Fxd,Pwr,6.8uH,20%,DO1813P-682HC
L5	1812-68915-261	Ind,Fxd,Pwr,6.8uH,20%,DO1813P-682HC
L6	1812-68915-261	Ind,Fxd,Pwr,6.8uH,20%,DO1813P-682HC
P101	2105-20018-305	Conn,Hdr,Dbl_Row,10_Pin,
P102	2105-20018-305	Conn,Hdr,Dbl_Row,10_Pin,
Q801	4823-30680-102	Xstr,Dig,NPN,47K/47K,SC-70
Q802	4823-30680-102	Xstr,Dig,NPN,47K/47K,SC-70
R1	4734-02801-311	Res,Cp,2.8K,1%,1/16W,0402
R2	4734-02211-311	Res,Cp,2.21K,1/16W,1%,0402
R3	4734-02432-311	Res,Cp,24.3K,1%,1/16W,0402
R4	4734-02432-311	Res,Cp,24.3K,1%,1/16W,0402
R5	4734-02213-311	Res,Cp,221K,1/16W,1%,0402
R6	4718-50398-962	Res,Cp,0.05_Ohm,5%,1/2W,1206
R7	4718-50398-962	Res,Cp,0.05_Ohm,5%,1/2W,1206
R8	4734-02432-311	Res,Cp,24.3K,1%,1/16W,0402
R9	4734-02432-311	Res,Cp,24.3K,1%,1/16W,0402
R10	4718-50398-960	Res,Cp,15_OHM,1/4W,5%,1206
R11	4718-50398-960	Res,Cp,15_OHM,1/4W,5%,1206
R12	4734-01002-311	Res,CP,10K,1%,1/16W,0402
R13	4734-01002-311	Res,CP,10K,1%,1/16W,0402
R14	4734-03482-311	Res,Cp,34.8K,1%,1/16W,0402
R15	4734-05622-311	Res,Cp,56.2K,1%,1/16W,0402
R16	4734-05622-311	Res,Cp,56.2K,1%,1/16W,0402
R17	4734-02212-311	Res,Cp,2.21K,1/16W,1%,0402
R20	4734-01002-311	Res,CP,10K,1%,1/16W,0402
R21	4734-01002-311	Res,CP,10K,1%,1/16W,0402
R26	4734-04992-311	Res,Cp,49.9K,1%,1/16W,0402
R29	4732-00000-008	Res,CP,0_Ohm,
R30	4732-00000-008	Res,CP,0_Ohm,

Item Reference Number	Part Number	Description
R31	4732-00000-008	Res,CP,0_Ohm,
R32	4732-00000-008	Res,CP,0_Ohm,
R33	4732-00000-008	Res,CP,0_Ohm,
R34	4732-00000-008	Res,CP,0_Ohm,
R35	4732-00000-008	Res,CP,0_Ohm,
R36	4732-00000-008	Res,CP,0_Ohm,
S1	5110-30910-602	Switch,Poly,miniSMDM075/24
U1	3130-20042-610	IC,Class-D Stereo,PA,LX1722CDB
U2	3134-30950-510	IC,N-CH,PwrTrench,FDS6912
U3	3134-30950-500	IC,P-CH,PwrTrench,FDS4953
U4	3134-30950-500	IC,P-CH,PwrTrench,FDS4953
U5	3134-30950-510	IC,N-CH,PwrTrench,FDS6912
U9	3134-30950-306	IC,LDO,REG-5V,500ma,LM2937,TO-263
U10	3134-30911-003	IC,OP_AMP,R/R,LT1783CS5,SOT-23

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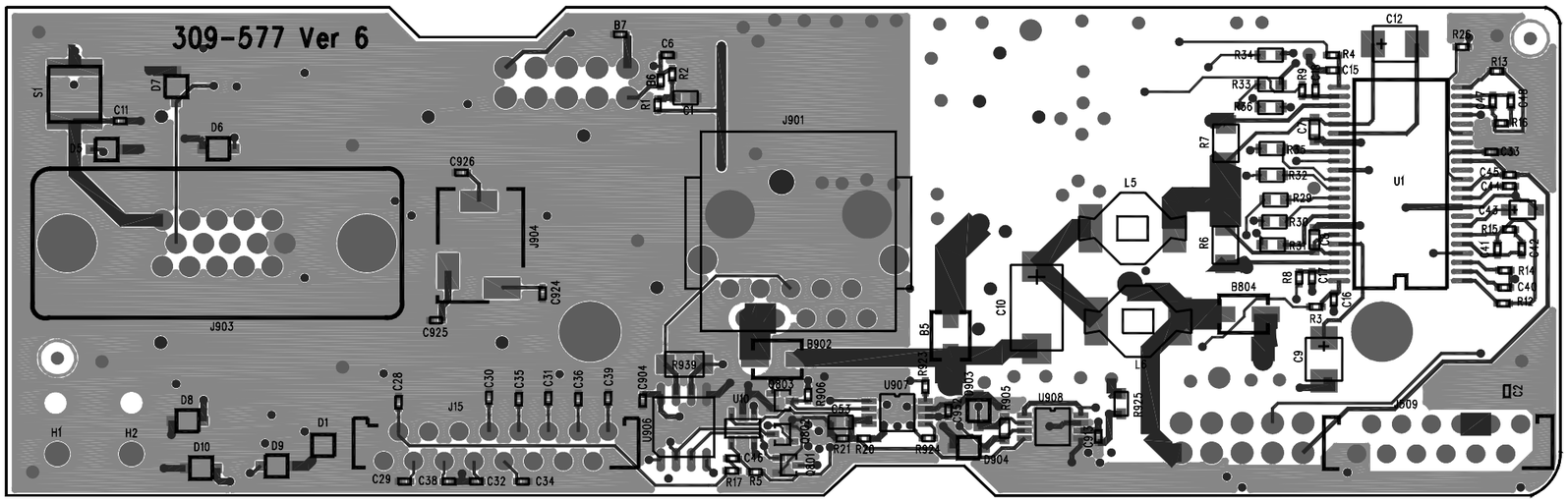

TOP SIDE

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND INCLUDE APPLIED FINISH TOLERANCES

TOLERANCES
2 PLACE DIM. ±.02 | 3 PLACE DIM. ±.005 | ANGLES ±1/2°
SCREW THREADS-AMERICAN NATIONAL CLASS CLASS-

THIRD ANGLE PROJECTION

RELM COMMUNICATIONS INC.
WEST MELBOURNE, FL. 32904

TITLE: PARTS PLACEMENT, OPTIONS BOARD, DMH

SIZE: B | DRAWING NO.: 8888-30957-700 | SCALE: 2.500 | REFERENCE: DMH | SHEET: 1 OF 2

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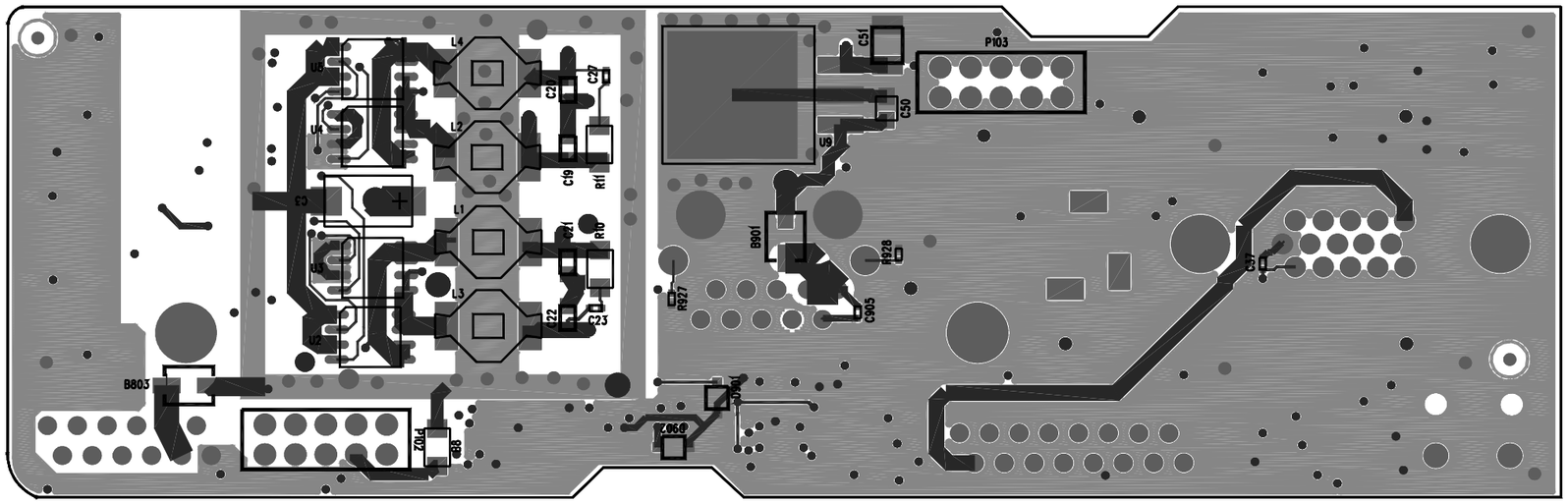

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TOLERANCES
2 PLACE DIM. ±.02 | 3 PLACE DIM. ±.005 | ANGLES ±1/2°
SCREW THREADS-AMERICAN NATIONAL CLASS CLASS-

THIRD ANGLE PROJECTION

RELM COMMUNICATIONS INC.
WEST MELBOURNE, FL. 32904

TITLE: PARTS PLACEMENT, OPTIONS BOARD, DMH

SIZE: B | DRAWING NO.: 8888-30957-700

SCALE: 2.500 | REFERENCE: DMH | SHEET: 2 OF 2

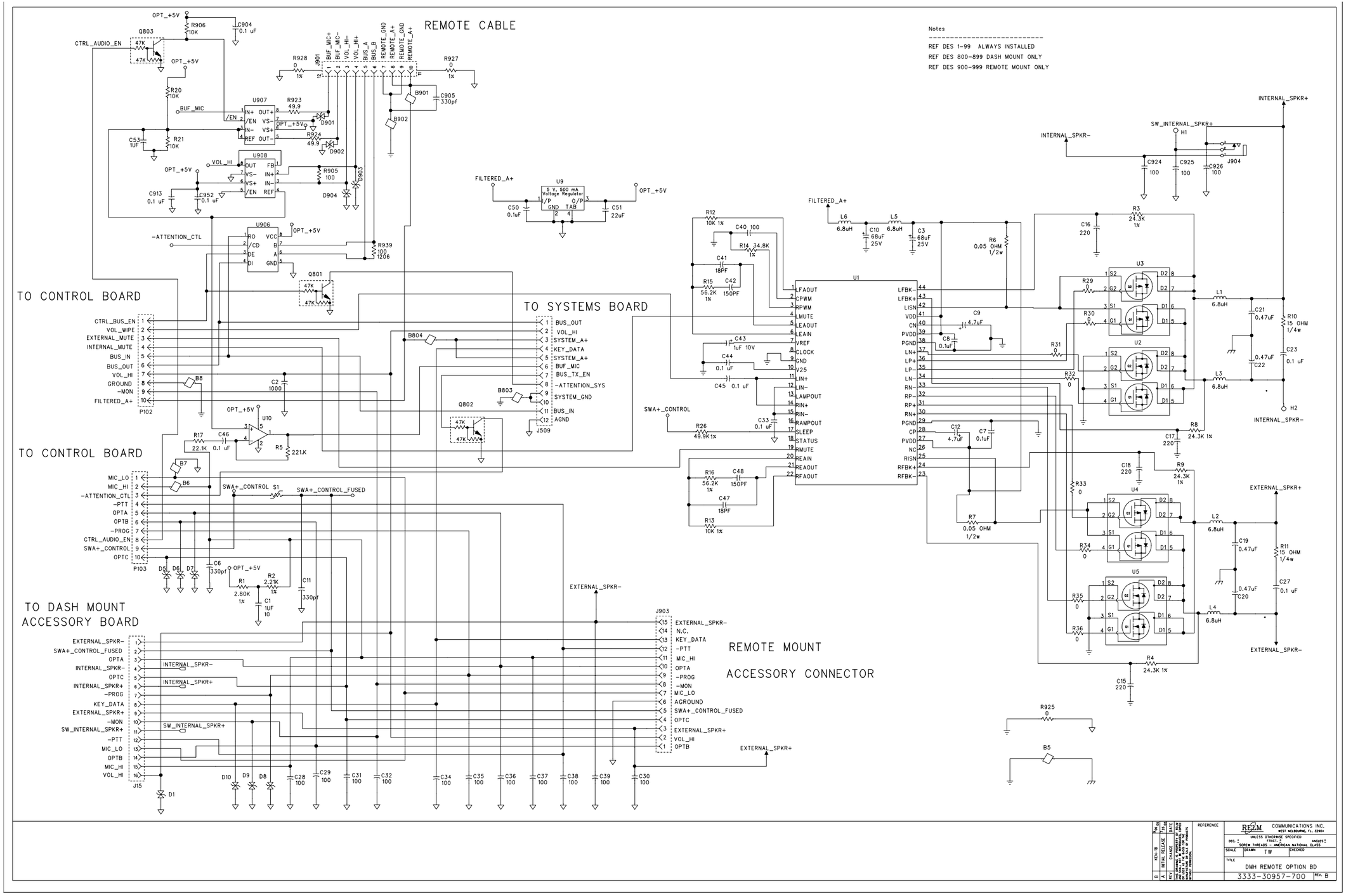

REMOTE CABLE
Notes
REF DES 1-99 ALWAYS INSTALLED
REF DES 800-899 DASH MOUNT ONLY
REF DES 900-999 REMOTE MOUNT ONLY
TO CONTROL BOARD
TO SYSTEMS BOARD
TO CONTROL BOARD
TO DASH MOUNT ACCESSORY BOARD
REMOTE MOUNT ACCESSORY CONNECTOR
P102
P103
J15
J509
J903
J901
J904
U1
U2
U3
U4
U5
U9
U10
U906
U907
U908
Q801
Q802
Q803
S1
D1
D5
D6
D7
D8
D9
D10
D901
D902
D903
D904
B901
B902
B803
B804
OPT_+5V
FILTERED_A+
SWA+_CONTROL
SWA+_CONTROL_FUSED
INTERNAL_SPKR+
INTERNAL_SPKR-
EXTERNAL_SPKR+
EXTERNAL_SPKR-
SW_INTERNAL_SPKR+
REMOTE_GND
REMOTE_A+
BUF_MIC
VOL_HI
-ATTENTION_CTL
CTRL_AUDIO_EN
5 V, 500 mA Voltage Regulator
REFERENCE
REALM COMMUNICATIONS INC.
WEST MELBOURNE, FL. 32904
DMH REMOTE OPTION BD
3333-30957-700
REV. B

Table 6-7. Replacement Parts, Options Board – Remote Mount

RESERVED

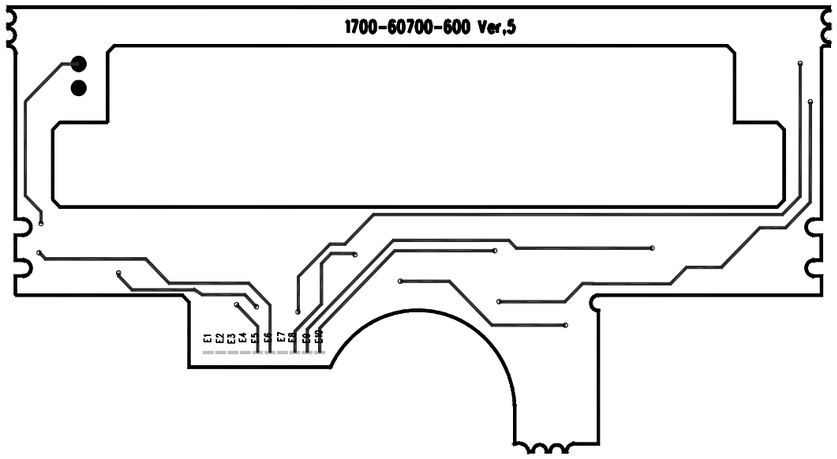
RESERVED

RESERVED

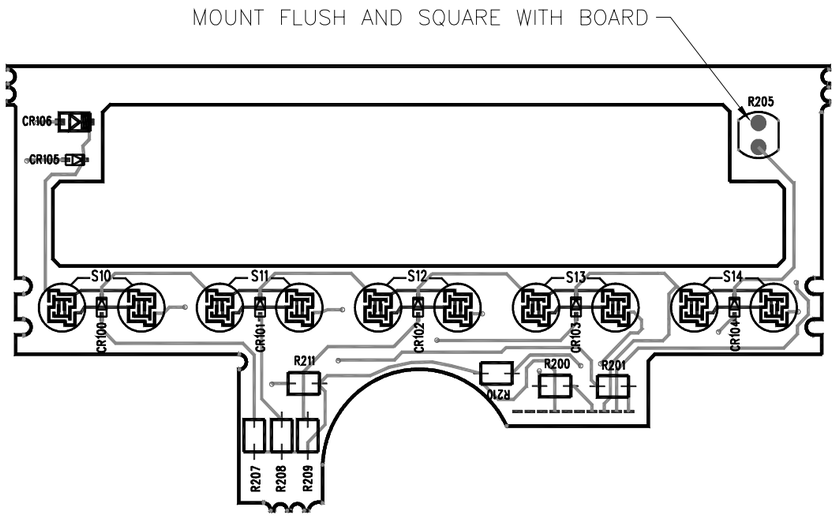
Table 6-8 Replacement Parts, Switch Board (607-006 Rev. D)

Item Reference Number	Part Number	Description
ITM 1	1700-60700-600	Board, PC, Switch
ITM 2	6008-20015-700	Cable,Jumper,Nomex,10-Cond,28GA
CR100	4824-30900-401	LED,GRN,SML-210MT,SMD
CR101	4824-30900-401	LED,GRN,SML-210MT,SMD
CR102	4824-30900-401	LED,GRN,SML-210MT,SMD
CR103	4824-30900-401	LED,GRN,SML-210MT,SMD
CR104	4824-30900-401	LED,GRN,SML-210MT,SMD
CR105	4824-30900-401	LED,GRN,SML-210MT,SMD
CR106	4826-20000-001	Di,LED,RED,BR1101W,SMD,
R200	4718-50317-149	Res,Cp,510_Ohm,1/8W,5%,1206,
R201	4718-50317-149	Res,Cp,510_Ohm,1/8W,5%,1206,
R205	3700-20026-105	Photo detector, VT93N1
R207	4718-50237-319	Res,Cp,1500_Ohm,1/8W,5%,1206,
R208	4718-50237-319	Res,Cp,1500_Ohm,1/8W,5%,1206,
R209	4718-50237-319	Res,Cp,1500_Ohm,1/8W,5%,1206,
R210	4718-50237-319	Res,Cp,1500_Ohm,1/8W,5%,1206,
R211	4718-50237-319	Res,Cp,1500_Ohm,1/8W,5%,1206,

REV	VER	REVISION				
		DRAWN BY:	CHK BY:	APPRD. BY:	EN:	DATE:
A	–	R.K.	-	BK	ENGR	11/93
A1	–	J.S.	-	BK	L940022	4/94
B	–	J.D	-	BK	BY-406	2/01
D	5	J.E. Villanueva	-	B. Dela Rosa	BY-750	08-01-05
REV C – VER 4 FELL THROUGH DURING REDESIGN STAGE (SEE BY-750)						



TOP SIDE



BOTTOM SIDE

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UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND INCLUDE APPLIED FINISH TOLERANCES

TOLERANCES
2 PLACE DIM. ±.02 3 PLACE DIM. ±.005 ANGLES ±1/2°
SCREW THREADS-AMERICAN NATIONAL CLASS CLASS-

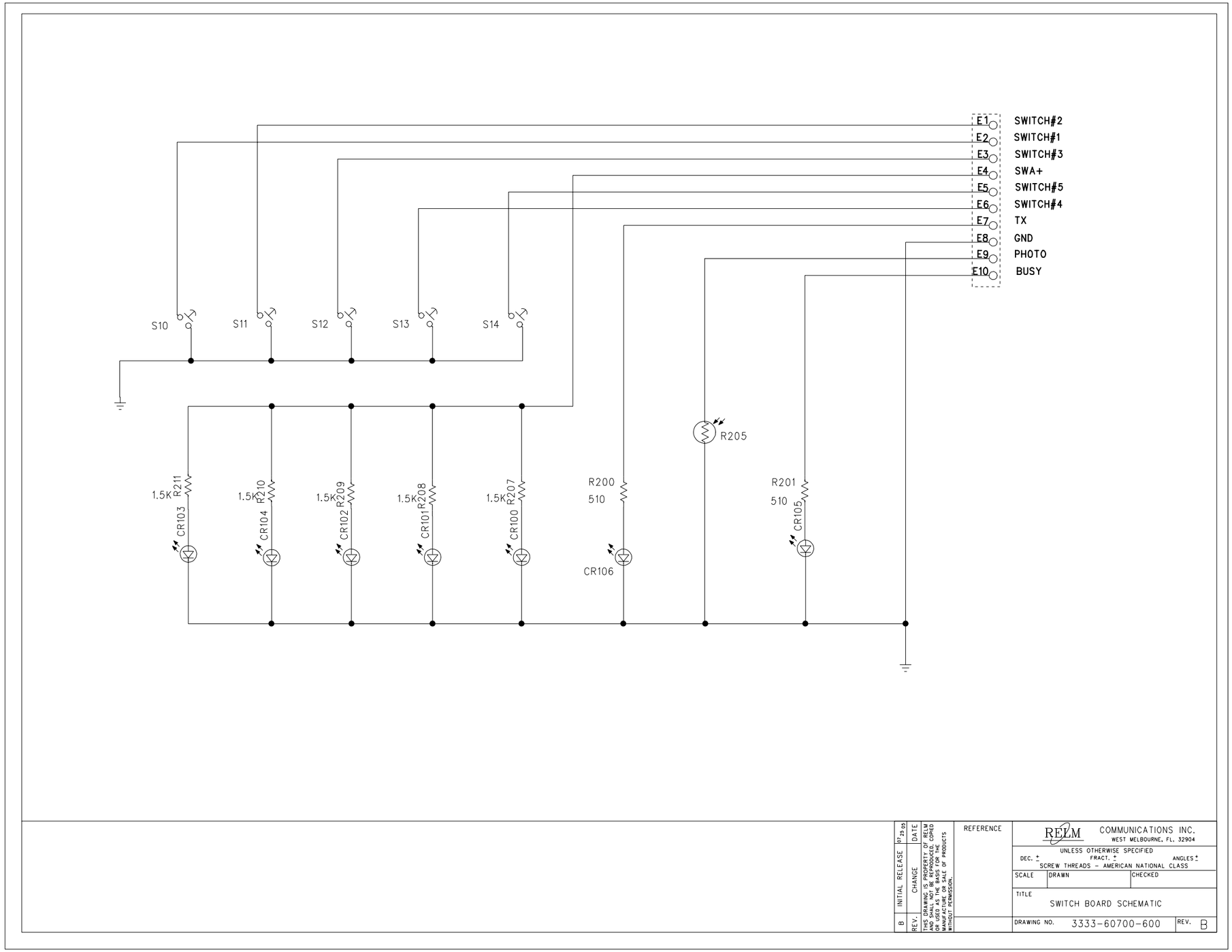
THIRD ANGLE PROJECTION

RELM COMMUNICATIONS INC.
WEST MELBOURNE, FL. 32904

TITLE: PARTS PLACEMENT, SWITCHBOARD, DMH

SIZE B | DRAWING NO.: 8888-60700-600

SCALE: 2.000 | REFERENCE: DMH | SHEET: 1 OF 1


E1 SWITCH#2
E2 SWITCH#1
E3 SWITCH#3
E4 SWA+
E5 SWITCH#5
E6 SWITCH#4
E7 TX
E8 GND
E9 PHOTO
E10 BUSY
S10
S11
S12
S13
S14
R205
R200
510
CR106
R201
510
CR105
1.5K R211
CR103
1.5K R210
CR104
1.5K R209
CR102
1.5K R208
CR101
1.5K R207
CR100
REV. B
INITIAL RELEASE 07 23 05
CHANGE
DATE
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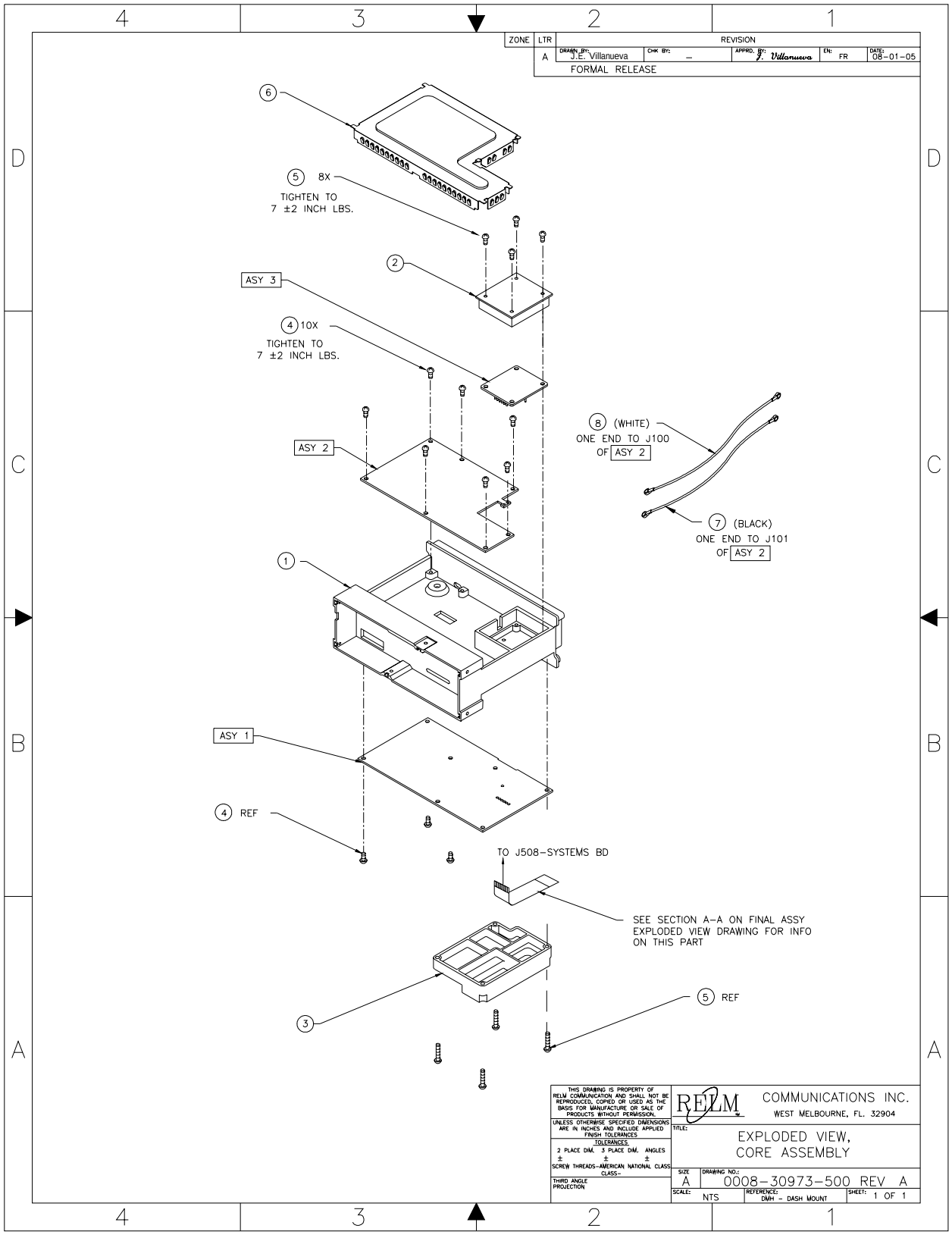
REFERENCE
RELM COMMUNICATIONS INC.
WEST MELBOURNE, FL. 32904
UNLESS OTHERWISE SPECIFIED
DEC. ± FRACT. ± ANGLES ±
SCREW THREADS – AMERICAN NATIONAL CLASS
SCALE DRAWN CHECKED
TITLE
SWITCH BOARD SCHEMATIC
DRAWING NO. 3333-60700-600 REV. B

Table 6-9 Replacement Parts, Core Assembly

Item Reference Number	Part Number	Description
ASSY 1	7031-30958-700	DMH, System Bd., SMD
ASSY 2	7031-30958-600	DMH, R/T Bd., SMD
ASSY 3	7011-30964-700	DMH VCO PC Bd,Sub-Assy
ITM 1	1411-60703-601	Chassis,Casting,
ITM 2	1411-40003-801	Cover,VCO,DiCast,EMH,
ITM 3	1411-40003-901	Cover,Synthesizer,DiCast,EMV,
ITM 4	2808-00250-036	Scr,Tapt,4-40,X1/4,P,PH,ST,ZN (QTY 10)
ITM 5	2808-00562-036	Scr,Tapt,4-40,X9/16,P,PH,ST,ZN (QTY 8)
ITM 6	2508-60703-500	Shield,Cvr_RX/TX,SHM,EM
ITM 7	6006-30971-300	Cable Assy, Coax, 6.3IN. DBL_ENDED,DMH (Black)
ITM 8	6006-30971-301	Cable Assy, Coax, 5.2IN. DBL_ENDED,DMH (White)


ZONE LTR REVISION
A FORMAL RELEASE
DRAWN BY: J.E. Villanueva
CHK BY: –
APPRD. BY: J. Villanueva
EN: FR
DATE: 08-01-05
6
5 8X
TIGHTEN TO
7 ±2 INCH LBS.
2
ASY 3
4 10X
TIGHTEN TO
7 ±2 INCH LBS.
ASY 2
8 (WHITE)
ONE END TO J100
OF ASY 2
7 (BLACK)
ONE END TO J101
OF ASY 2
1
ASY 1
4 REF
TO J508-SYSTEMS BD
SEE SECTION A-A ON FINAL ASSY
EXPLODED VIEW DRAWING FOR INFO
ON THIS PART
3
5 REF
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UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND INCLUDE APPLIED FINISH TOLERANCES
TOLERANCES
2 PLACE DIM. ± 3 PLACE DIM. ± ANGLES ±
SCREW THREADS-AMERICAN NATIONAL CLASS CLASS-
THIRD ANGLE PROJECTION
RELM COMMUNICATIONS INC.
WEST MELBOURNE, FL. 32904
TITLE: EXPLODED VIEW, CORE ASSEMBLY
SIZE A
DRAWING NO.: 0008-30973-500 REV A
SCALE: NTS
REFERENCE: DMH - DASH MOUNT
SHEET: 1 OF 1

Table 6-10. Replacement Parts, RX/TX Board (309-586, Rev. B)

Item Reference Number	Part Number	Description
ITM 1	1700-30958-600	PCB, DMH_R/T Bd.
ITM 2	3110-20019-401	Insulator,Xtal (QTY 2)
ITM 3	6022-00000-001	Wire,Buss,22GA,Tin
ITM 4	2508-30968-401	Shield, Solder Down, RxTx
ITM 5	2508-30968-401	Shield, Solder Down, RxTx
C1	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C2	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C3	1575-01820-171	Cap,Cp,82pF,5%, NPO, 250V,0603
C4	1570-03103-261	Cap,Cp,.01uF,5%,X7R,16V,0402
C5	1575-01820-171	Cap,Cp,82pF,5%, NPO, 250V,0603
C6	1570-03103-261	Cap,Cp,.01uF,5%,X7R,16V,0402
C7	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C8	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C9	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C10	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C11	1570-03103-261	Cap,Cp,.01uF,5%,X7R,16V,0402
C12	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C13	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C14	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C15	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C16	1570-03103-261	Cap,Cp,.01uF,5%,X7R,16V,0402
C17	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C18	1570-03103-261	Cap,Cp,.01uF,5%,X7R,16V,0402
C19	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C20	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C21	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C22	1575-01820-171	Cap,Cp,82pF,5%, NPO, 250V,0603
C23	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C24	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C25	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C26	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C27	1570-00105-777	Cp,Cap,1uF,X5R,10%,10V,0603

Item Reference Number	Part Number	Description
C28	1570-00220-163	Cap,CP,22pF,5%,COG,50V,0603,
C29	1570-00104-272	Cap,Cp,.1uF,10%,X7R,25V,0603
C30	1570-03103-261	Cap,Cp,.01uF,5%,X7R,16V,0402
C31	1570-03910-163	Cap,CP,91pF,NPO,5%,50V,0402
C32	1570-03103-261	Cap,Cp,.01uF,5%,X7R,16V,0402
C33	1570-03150-163	Cap,CP,15pF,NPO,5%,50V,0402
C34	1570-03103-261	Cap,Cp,.01uF,5%,X7R,16V,0402
C35	1570-03508-173	Cap,Cp,0.5pF,10%,NPO,50V,0402
C36	1570-03829-113	Cap,CP,8.2pF,NPO,+/-.25pF,50V,0402
C37	1570-03120-163	Cap,CP,12pF,NPO,5%,50V,0402
C38	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C39	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C40	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C41	1570-00105-777	Cp,Cap,1uF,X5R,10%,10V,0603
C42	1570-03103-261	Cap,Cp,.01uF,5%,X7R,16V,0402
C43	1570-01105-271	Cap,CP,1uF,X7R,10%,16V,0805
C44	1570-03150-163	Cap,CP,15pF,NPO,5%,50V,0402
C45	1570-00103-273	Cap,CP,10nF,10%,X7R,50V,0603,
C46	1570-02106-778	Cap,CP,10uF,X5R,10%,1206
C47	1570-03150-163	Cap,CP,15pF,NPO,5%,50V,0402
C48	1570-00103-273	Cap,CP,10nF,10%,X7R,50V,0603,
C49	1570-02106-778	Cap,CP,10uF,X5R,10%,1206
C50	1570-00105-777	Cp,Cap,1uF,X5R,10%,10V,0603
C51	1570-00105-777	Cp,Cap,1uF,X5R,10%,10V,0603
C52	1570-00105-777	Cp,Cap,1uF,X5R,10%,10V,0603
C53	1570-00105-777	Cp,Cap,1uF,X5R,10%,10V,0603
C54	1570-00105-777	Cp,Cap,1uF,X5R,10%,10V,0603
C55	1570-00105-777	Cp,Cap,1uF,X5R,10%,10V,0603
C56	1570-00105-777	Cp,Cap,1uF,X5R,10%,10V,0603
C57	1570-00105-777	Cp,Cap,1uF,X5R,10%,10V,0603
C58	1570-03103-261	Cap,Cp,.01uF,5%,X7R,16V,0402
C59	1570-03103-261	Cap,Cp,.01uF,5%,X7R,16V,0402
C60	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C61	1570-03103-261	Cap,Cp,.01uF,5%,X7R,16V,0402

Item Reference Number	Part Number	Description
C62	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C63	1570-00104-272	Cap,Cp,.1uF,10%,X7R,25V,0603
C64	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C65	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C66	1570-03221-163	Cap,Cp,220PF,NPO,5%,50V,0402
C67	1570-03222-273	Cap,CP,2200pF,X7R,10%,50V,0402
C68	1570-00224-277	Cap,CP,0.22uF,10%,X7R,10V,0603,
C69	1570-00223-273	Cap,Cp,.022uF,X7R,10%,50V,0603
C70	1570-00104-272	Cap,Cp,.1uF,10%,X7R,25V,0603
C71	1570-03221-163	Cap,Cp,220PF,NPO,5%,50V,0402
C72	1570-03102-273	Cap,Cp,1000pF,X7R,10%,50V,0402
C73	1570-03104-777	Cap,Cp,0.1uF,10%,X5R,10V,0402
C74	1570-03104-777	Cap,Cp,0.1uF,10%,X5R,10V,0402
C75	1570-03103-261	Cap,Cp,.01uF,5%,X7R,16V,0402
C76	1570-03103-261	Cap,Cp,.01uF,5%,X7R,16V,0402
C77	1570-03103-261	Cap,Cp,.01uF,5%,X7R,16V,0402
C78	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C79	1570-03103-261	Cap,Cp,.01uF,5%,X7R,16V,0402
C80	1570-03103-261	Cap,Cp,.01uF,5%,X7R,16V,0402
C81	1570-03103-261	Cap,Cp,.01uF,5%,X7R,16V,0402
C82	1570-03103-261	Cap,Cp,.01uF,5%,X7R,16V,0402
C83	1570-03121-153	Cap,CP,120pF,NPO,2%,50V,0402
C84	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C85	1570-03820-153	Cap,CP,82pF,NPO,2%,50V,0402
C86	1570-00224-277	Cap,CP,0.22uF,10%,X7R,10V,0603,
C87	1570-00223-273	Cap,Cp,.022uF,X7R,10%,50V,0603
C88	1570-03910-163	Cap,CP,91pF,NPO,5%,50V,0402
C89	1570-00104-272	Cap,Cp,.1uF,10%,X7R,25V,0603
C90	1570-00104-272	Cap,Cp,.1uF,10%,X7R,25V,0603
C91	1570-00104-272	Cap,Cp,.1uF,10%,X7R,25V,0603
C92	1575-01820-171	Cap,Cp,82pF,5%, NPO, 250V,0603
C93	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C94	1570-00629-163	Cap,Cp,6.2pF,5%,NPO,50V,0603
C95	1570-03103-261	Cap,Cp,.01uF,5%,X7R,16V,0402

Item Reference Number	Part Number	Description
C96	1570-03220-163	Cap,Cp,22pF,5%,NPO,50V,0402
C97	1570-03220-163	Cap,Cp,22pF,5%,NPO,50V,0402
C98	1570-03220-163	Cap,Cp,22pF,5%,NPO,50V,0402
C111	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C112	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C113	1570-00339-163	Cap,Cp,3.3pF,5%,NPO,50V,0603
C114	1570-00104-272	Cap,Cp,.1uF,10%,X7R,25V,0603
C115	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C116	1570-00309-113	Cap,CP,3.0pF,NPO,+/-.25pF,50V,0603
C117	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C118	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C119	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C120	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C121	1570-00150-163	Cap,CP,15pF,5%,COG,50V,0603,
C122	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C123	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
CR1	4824-20021-101	Di,Var-Dual,BBY58-05W,SOT-323
CR2	4824-20021-101	Di,Var-Dual,BBY58-05W,SOT-323
CR3	4824-20021-400	Di,Var-Dual,BB814,SOT-23,
CR4	4824-20021-400	Di,Var-Dual,BB814,SOT-23,
CR5	4824-20021-400	Di,Var-Dual,BB814,SOT-23,
CR6	4824-20021-400	Di,Var-Dual,BB814,SOT-23,
CR7	4824-20021-400	Di,Var-Dual,BB814,SOT-23,
CR8	4824-30541-303	Di,Dual,Schottky,SC-70
CR9	4824-20021-400	Di,Var-Dual,BB814,SOT-23,
CR10	4824-20021-400	Di,Var-Dual,BB814,SOT-23,
CR11	4824-20021-400	Di,Var-Dual,BB814,SOT-23,
CR12	4824-20021-400	Di,Var-Dual,BB814,SOT-23,
CR13	4824-20021-400	Di,Var-Dual,BB814,SOT-23,
CR14	4824-20021-400	Di,Var-Dual,BB814,SOT-23,
CR15	4824-30541-303	Di,Dual,Schottky,SC-70
CR16	4824-30541-303	Di,Dual,Schottky,SC-70

Item Reference Number	Part Number	Description
FB1	2503-02121-505	Bead,Fer.,120_OHMS@100MHz,200ma,0402
FB2	2503-02121-505	Bead,Fer.,120_OHMS@100MHz,200ma,0402
FB3	2503-02121-505	Bead,Fer.,120_OHMS@100MHz,200ma,0402
FB4	2503-02121-505	Bead,Fer.,120_OHMS@100MHz,200ma,0402
FB5	2503-02121-505	Bead,Fer.,120_OHMS@100MHz,200ma,0402
FB6	2503-02121-505	Bead,Fer.,120_OHMS@100MHz,200ma,0402
FL1	2705-20022-600	Fltr,Xtal,16.9MHz,15KHZBW,4P
FL2	2705-20022-600	Fltr,Xtal,16.9MHz,15KHZBW,4P
J71	2108-20017-401	Socket,Mini,Spring,
J72	2108-20017-401	Socket,Mini,Spring,
J100	2101-50522-100	CONN,RECEPTACLE,SMT
J101	2101-50522-100	CONN,RECEPTACLE,SMT
L1	1801-20023-407	Ind,Fxd_AW_Coil,2T,20GA,0.076D,Lft_Hnd,
L2	1801-20023-409	Ind,Fxd_AW_Coil,5T,20GA,0.086D,Lft_Hnd,
L3	1801-20023-406	Ind,Fxd_AW_Coil,5T,20GA,0.072D,Lft_Hnd
L4	1801-20023-411	Ind,Fxd_AW_Coil,3T,20GA,0.07D,Lft_Hnd
L5	1801-20023-421	Ind,Fxd_AW_Coil,2T,20GA,0.08D,Lft_Hnd
L6	1812-18003-050	Ind,Cp,18nH,5%,1008CS
L7	1801-20023-422	Ind,Fxd_AW_Coil,2T,20GA,0.06D,Lft_Hnd
L8	1801-20023-421	Ind,Fxd_AW_Coil,2T,20GA,0.08D,Lft_Hnd
L9	1801-20023-424	Ind,Fxd_AW_Coil,4T,20GA,0.069,Lft_Hand
L10	1801-20023-422	Ind,Fxd_AW_Coil,2T,20GA,0.06D,Lft_Hnd
L11	1812-10912-050	Ind,Cp,1uH,2%,1008CS
L12	1812-47913-091	Ind,Cp,4.7uH,5%,1008LS
L13	1812-39103-050	Ind,Cp,390nH,5%,1008CS
L14	1812-10103-020	Ind,CP,100nH,5%,0805
L15	1812-10013-091	Ind,Cp,10uH,5%,1008LS
L16	1812-10013-091	Ind,Cp,10uH,5%,1008LS
L17	1812-15913-050	Ind,Cp,1.5uH,5%,1008CS
L18	1812-91003-020	Ind,Cp,91nH,5%,0805
L19	1812-82103-020	Ind,Cp,820nH,5%,0805

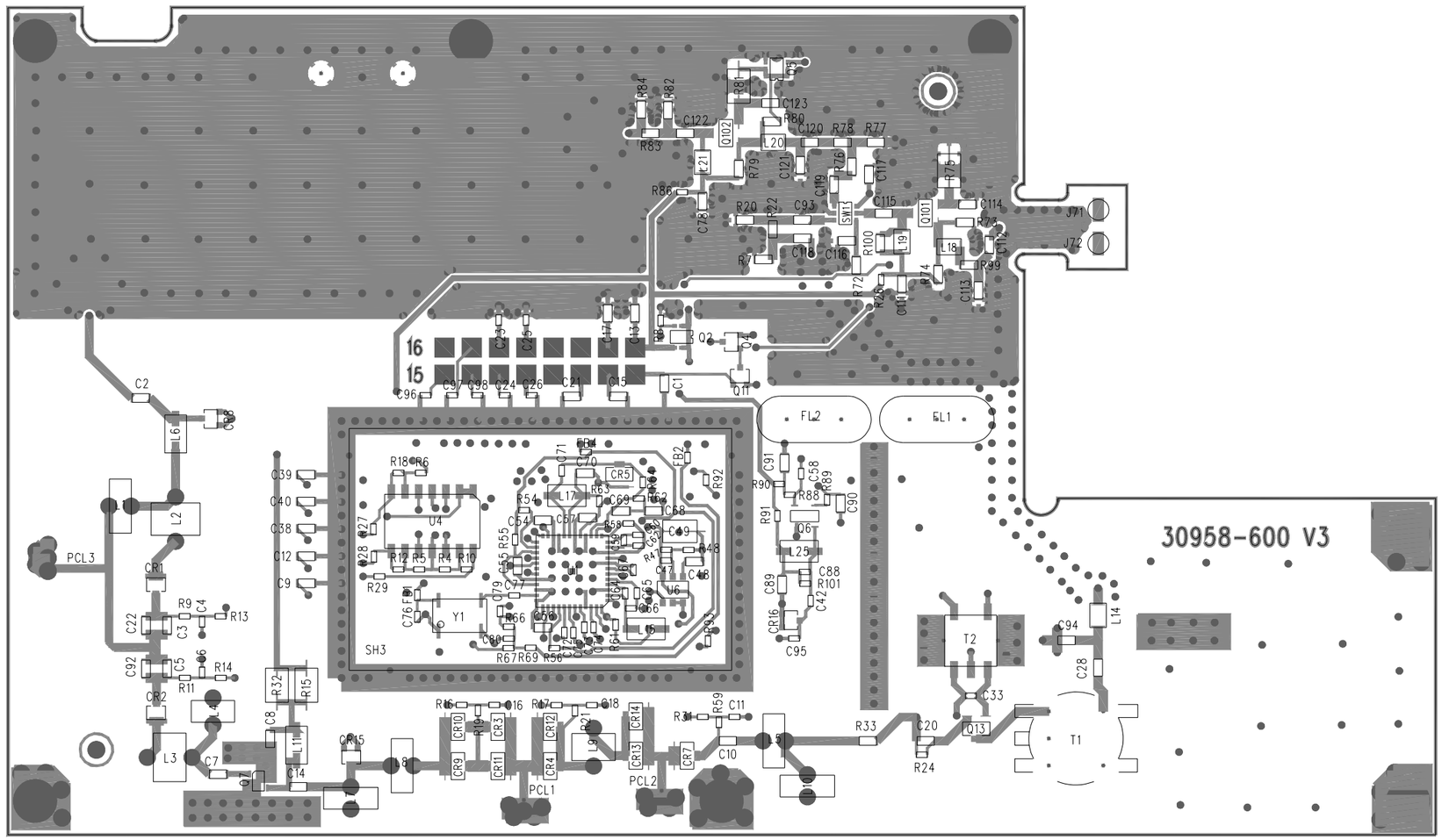
Item Reference Number	Part Number	Description
L20	1812-68003-020	Ind,Cp,68nH,5%,0805CS
L21	1812-82103-020	Ind,Cp,820nH,5%,0805
L22	1812-10913-091	Ind,Cp,1.0uH,5%,1008LS
L23	1812-10013-091	Ind,Cp,10uH,5%,1008LS
L25	1812-10912-050	Ind,Cp,1uH,2%,1008CS
P5	2105-20017-808	Conn,Hdr,Dbl_Row
Q1	4823-30562-201	Xstr,RF,BFR92A
Q2	3134-30950-520	IC,N-CH,PwrTrench,FDG328P,SC70-6
Q4	4823-30680-101	Xstr,Digital,PNP,10K/47K,SC-70
Q5	3134-30950-521	IC,N-CH,PwrTrench,FDG329N,SC70-6
Q6	4823-30595-803	Xstr,N-Ch,Dual,MFET,BF1212,SOT143B
Q7	4823-30562-202	Xstr.MMIC Amp, Sil Germ,BGA614,SOT343
Q11	4823-30680-102	Xstr,Dig,NPN,47K/47K,SC-70
Q12	4823-50483-200	Xstr,NJFET,Rf_Sm_Sig,MMBFU310,SOT-23,
Q13	4823-50483-200	Xstr,NJFET,Rf_Sm_Sig,MMBFU310,SOT-23,
Q14	4823-50483-200	Xstr,NJFET,Rf_Sm_Sig,MMBFU310,SOT-23,
Q101	4823-30741-302	Xstr,PNP,Rf_Sm_Sig_BFR106,SOT-23
Q102	4823-30741-302	Xstr,PNP,Rf_Sm_Sig_BFR106,SOT-23
R1	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R2	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R3	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R4	4734-01003-311	Res,CP,100K,1%,1/16W,0402
R5	4734-01003-311	Res,CP,100K,1%,1/16W,0402
R6	4734-01003-311	Res,CP,100K,1%,1/16W,0402
R7	4734-02210-511	Res,CP,100K,1%,1/16W,0402
R8	4734-01003-311	Res,CP,100K,1%,1/16W,0402
R9	4734-01213-311	Res,CP,121K,1%,1/16W,0402
R10	4734-02003-311	Res,Cp,200K,1%,1/16W,0402
R11	4734-01213-311	Res,CP,121K,1%,1/16W,0402
R12	4734-02003-311	Res,Cp,200K,1%,1/16W,0402
R13	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402

Item Reference Number	Part Number	Description
R14	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R15	4728-03570-315	Res,Cp,357_Ohms,1%,1/4W,1206
R16	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R17	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R18	4734-02003-311	Res,Cp,200K,1%,1/16W,0402
R19	4734-01213-311	Res,CP,121K,1%,1/16W,0402
R20	4732-02210-511	Res,Cp,221_Ohm,1%,1/16W,0603
R21	4734-01213-311	Res,CP,121K,1%,1/16W,0402
R22	4732-02379-511	Res,Cp,23.7_Ohm,1%,1/16W,0603
R23	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R24	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R26	4734-01009-311	Res,Cp,10_Ohms,1/16W,1%,0402
R27	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R28	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R29	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R30	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R31	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R32	4728-03570-315	Res,Cp,357_Ohms,1%,1/4W,1206
R33	4732-00000-008	Res,CP,0_Ohm,
R34	4734-01211-311	Res,Cp,1.21K,1%,1/16W,0402
R35	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R36	4734-01211-311	Res,Cp,1.21K,1%,1/16W,0402
R37	4718-50237-317	Res,Cp,270_Ohm,1/8W,5%,1206,
R38	4734-01000-311	Res,Cp,100_ohm,1%,1/16W,0402
R39	4734-01003-311	Res,CP,100K,1%,1/16W,0402
R40	4734-01783-311	Res,Cp,178K,1/16W,1%,0402
R41	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R42	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R43	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R44	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R45	4734-04322-311	Res,CP,43.2K,1%,1/16W,0402
R46	4734-03012-311	Res,CP,30.1K,1%,1/16W,0402
R47	4734-08062-311	Res,Cp,80.6K,1%,1/16W,0402
R48	4734-03012-311	Res,CP,30.1K,1%,1/16W,0402

Item Reference Number	Part Number	Description
R49	4734-01009-311	Res,Cp,10_Ohms,1/16W,1%,0402
R50	4734-01009-311	Res,Cp,10_Ohms,1/16W,1%,0402
R51	4734-01009-311	Res,Cp,10_Ohms,1/16W,1%,0402
R52	4734-01009-311	Res,Cp,10_Ohms,1/16W,1%,0402
R53	4734-01009-311	Res,Cp,10_Ohms,1/16W,1%,0402
R54	4734-01009-311	Res,Cp,10_Ohms,1/16W,1%,0402
R55	4734-01009-311	Res,Cp,10_Ohms,1/16W,1%,0402
R56	4734-01009-311	Res,Cp,10_Ohms,1/16W,1%,0402
R57	4734-01009-311	Res,Cp,10_Ohms,1/16W,1%,0402
R58	4734-01003-311	Res,CP,100K,1%,1/16W,0402
R59	4734-01213-311	Res,CP,121K,1%,1/16W,0402
R60	4734-02009-311	Res,Cp,20_Ohms,1/16W,1%,0402
R61	4734-04999-311	Res,Cp,49.9_Ohms,1%,1/16W,0402
R62	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R63	4734-01821-311	Res,Cp,1.82K,1%,1/16W,0402
R64	4734-01002-311	Res,CP,10K,1%,1/16W,0402
R65	4734-02001-311	Res,CP,2K,1%,1/16W,0402
R66	4734-02000-311	Res,Cp,200_Ohms,1%,1/16W,0402
R67	4734-05112-311	Res,Cp,51.1K,1%,1/16W,0402
R68	4734-02002-311	Res,Cp,20K,1%,1/16W,0402
R69	4734-01009-311	Res,Cp,10_Ohms,1/16W,1%,0402
R70	4734-02009-311	Res,Cp,20_Ohms,1/16W,1%,0402
R71	4734-01000-311	Res,Cp,100_ohm,1%,1/16W,0402
R72	4732-05112-511	Res,Cp,51.1K,1%,1/16W,0603
R73	4732-01001-511	Res,Cp,1K,1%,1/16W,0603
R74	4732-02431-511	Res,Cp,2.43K,1%,1/16W,0603
R75	4728-06819-315	Res,Cp,68.1_Ohms,1%,1/4W,1206
R76	4732-02619-511	Res,Cp,26.1_Ohm,1%,1/16W,0603
R77	4732-03489-511	Res,Cp,34.8_Ohm,1%,1/16W,0603
R78	4732-02619-511	Res,Cp,26.1_Ohm,1%,1/16W,0603
R79	4732-02431-511	Res,Cp,2.43K,1%,1/16W,0603
R80	4732-01001-511	Res,Cp,1K,1%,1/16W,0603
R81	4728-03909-315	Res,Cp,39_Ohms,1%,1/4W,1206
R82	4732-04320-511	Res,Cp,432_Ohm,1%,1/16W,0603

Item Reference Number	Part Number	Description
R83	4732-01159-511	Res,Cp,11.5_Ohm,1%,1/16W,0603
R84	4732-04320-511	Res,Cp,432_Ohm,1%,1/16W,0603
R85	4734-02001-311	Res,CP,2K,1%,1/16W,0402
R86	4734-01009-311	Res,Cp,10_Ohms,1/16W,1%,0402
R88	4734-01004-311	Res,Cp,1M,1%,1/16W,0402
R89	4734-01002-311	Res,CP,10K,1%,1/16W,0402
R90	4734-01000-311	Res,Cp,100_ohm,1%,1/16W,0402
R91	4734-01009-311	Res,Cp,10_Ohms,1/16W,1%,0402
R92	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R93	4734-01000-311	Res,Cp,100_ohm,1%,1/16W,0402
R99	4732-02219-511	Res,Cp,22.1_Ohm,1%,1/16W,0603
R100	4732-01001-511	Res,Cp,1K,1%,1/16W,0603
R101	4734-03740-311	Res,Cp,374_Ohm,1%,1/16W,0402
R102	4732-02000-511	Res,Cp,200_Ohm,1%,1/16W,0603
R103	4732-02000-511	Res,Cp,200_Ohm,1%,1/16W,0603
SW1	3134-30906-203	IC,RF_SW,SPDT,MFET,PE4259,SC-70
T1	5602-20024-400	Transfmr,Mixer
T2	5610-20024-300	Transfmr,IF,
U1	3134-30670-622	IC,IF,Digit,Subsys,AD9864BCPZ,CP-48
U2	3134-30940-811	IC,8-Bit,DAC,LTC1665IGN,SSOP-16
U3	3134-20040-200	Ic,OPA,LMC660,SO14
U4	3134-20040-200	Ic,OPA,LMC660,SO14
U5	3134-30950-304	IC,REG,ADJ,LDO,100ma,TPS79101DBV,SOT-23
U6	3134-30950-304	IC,REG,ADJ,LDO,100ma,TPS79101DBV,SOT-23
Y1	2390-30957-100	TCXO, 19.6608 MHz, SMD

REV	VER	REVISION				
		DRAWN BY:	CHK BY:	APPRD. BY:	EN:	DATE:
B	2	J.E. Villanueva		C. McClanahan	FR	07-29-05
C	3	J.E. Villanueva		C. McClanahan	KEN-23	10-25-05



TOP SIDE

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND INCLUDE APPLIED FINISH TOLERANCES

TOLERANCES

2 PLACE DIM. ±.02 | 3 PLACE DIM. ±.005 | ANGLES ±1/2°

SCREW THREADS-AMERICAN NATIONAL CLASS -CLASS-

THIRD ANGLE PROJECTION

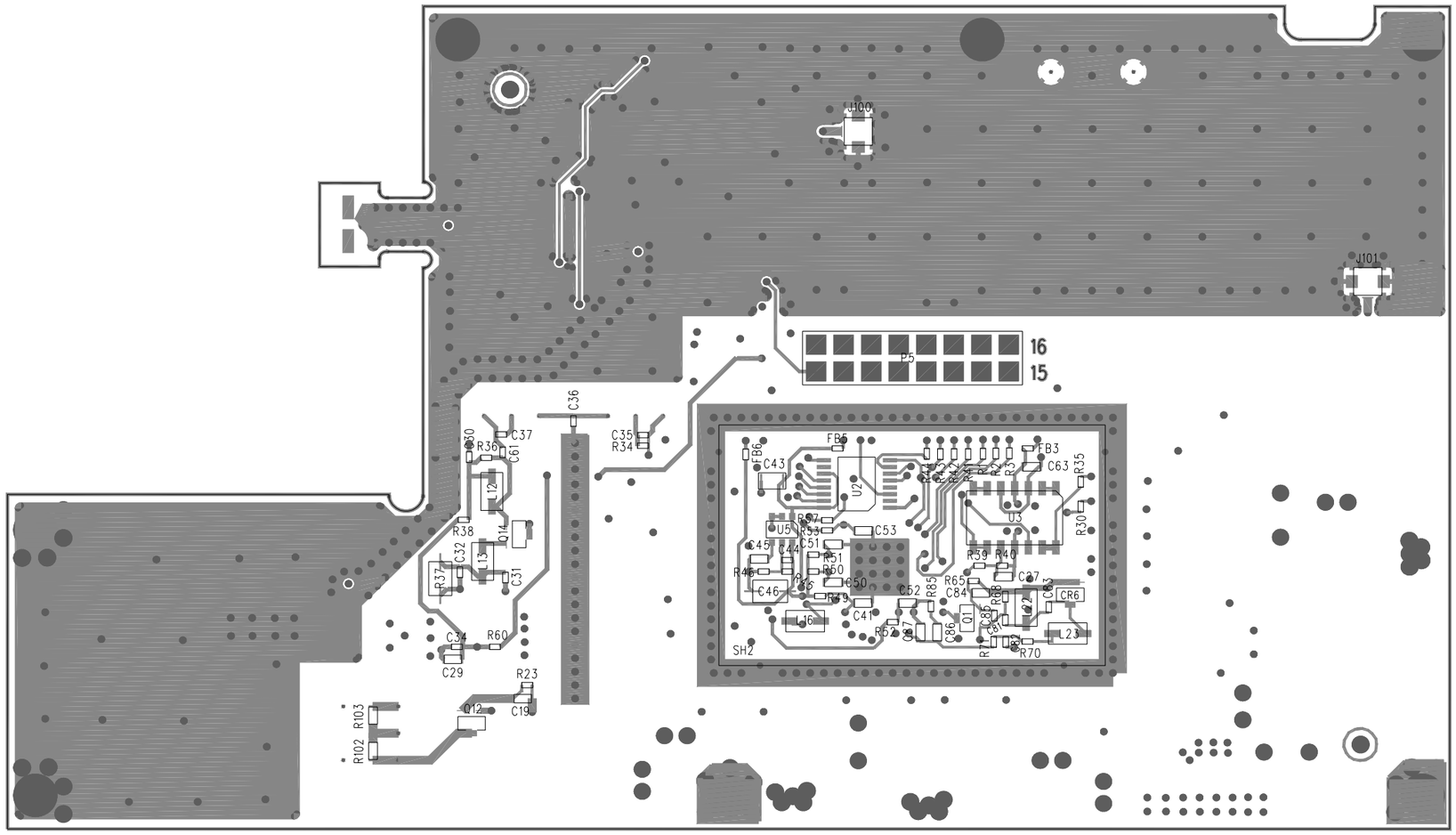
RELM COMMUNICATIONS INC.
WEST MELBOURNE, FL. 32904

TITLE: PARTS PLACEMENT, RXTX BOARD, DMH

SIZE: B | DRAWING NO.: 8888-30958-600

SCALE: 2.500 | REFERENCE: DMH | SHEET: 1 OF 2

REV	VER	REVISION				
		DRAWN BY:	CHK BY:	APPRD. BY:	EN:	DATE:
B	2	J.E. Villanueva		C. McClanahan	FR	07-29-05
C	3	J.E. Villanueva		C. McClanahan	KEN-23	10-25-05



BOTTOM SIDE

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND INCLUDE APPLIED FINISH TOLERANCES

TOLERANCES
2 PLACE DIM. ±.02
3 PLACE DIM. ±.005
ANGLES ±1/2°
SCREW THREADS-AMERICAN NATIONAL CLASS CLASS-

THIRD ANGLE PROJECTION

RELM COMMUNICATIONS INC.
WEST MELBOURNE, FL. 32904

TITLE: PARTS PLACEMENT, RXTX BOARD, DMH

SIZE: B
DRAWING NO.: 8888-30958-600
SCALE: 2.500
REFERENCE: DMH
SHEET: 2 OF 2

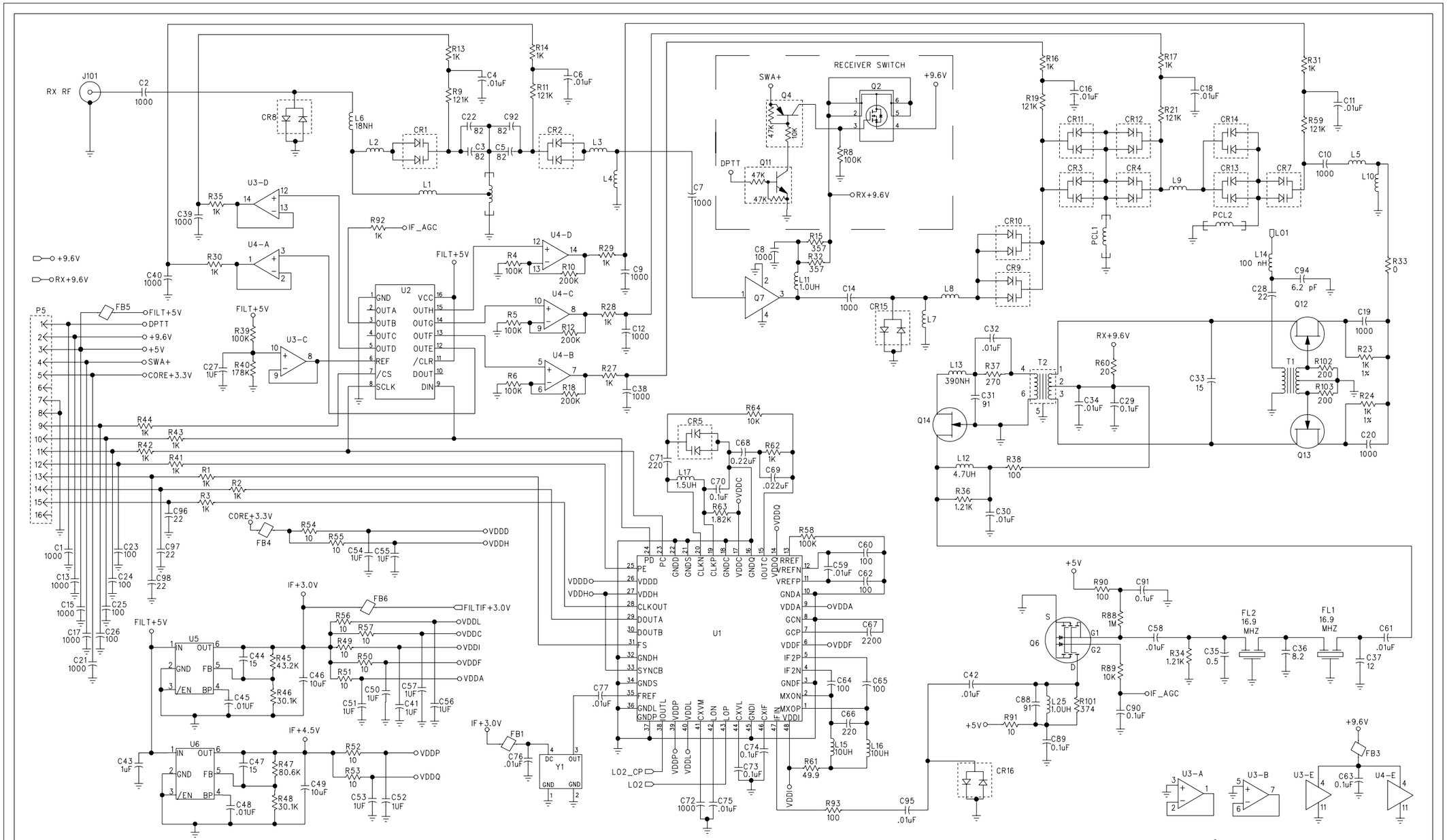
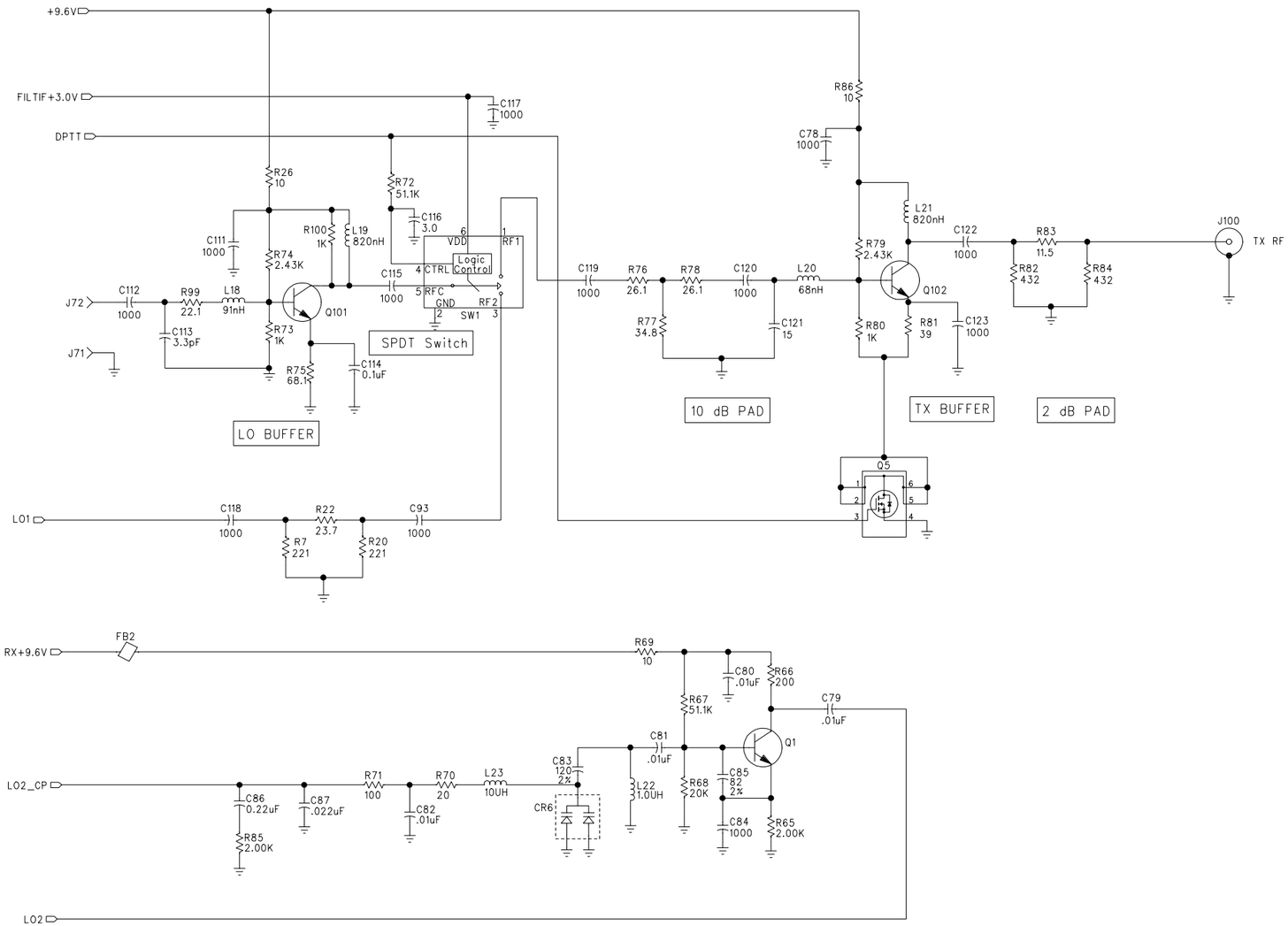


Figure 6-17.1 RX/TX Board Schematic

[Sheet 1]



REFERENCE

RELM COMMUNICATIONS INC. WEST MELBOURNE, FL. 32904

UNLESS OTHERWISE SPECIFIED
DEC. ± FRACT. ± ANGLES ±
SCREW THREADS – AMERICAN NATIONAL CLASS

SCALE	DRAWN	CHECKED
NONE	CM	RG

TITLE: DMH RX/TX BOARD SCHEMATIC

3333-30958-600 SHEET 2 OF 2 REV. B

Figure 6-17.2 RX/TX Board Schematic

[Sheet 2]

Table 6-11. Replacement Parts, System Board (309-587, Rev. C)

Item Reference Number	Part Number	Description
ITM 1	1700-30958-700	PCB, DMH System Bd.
ITM 2	1601-20000-903	Tape,Foam,3/8WX1/16th,
C501	1552-60463-127	Cap,Cp_Tant,15UF,10%,25V,125D,7243,
C502	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C503	1570-02225-271	Cap,CP,2.2uF,X7R,10%,16V,1206
C504	1570-02225-271	Cap,CP,2.2uF,X7R,10%,16V,1206
C505	1570-01224-271	Cap,CP,.22uF,X7R,10%,16V,0805
C506	1570-00105-777	Cp,Cap,1uF,X5R,10%,10V,0603
C507	1570-05105-781	Cap,Cp,1uF,X5R,+/-20%,16V,0805
C508	1570-03102-271	Cap,CP,1000pf,10%,X7R,10V,0402
C509	1570-03102-271	Cap,CP,1000pf,10%,X7R,10V,0402
C510	1570-03103-261	Cap,Cp,.01uF,5%,X7R,16V,0402
C511	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C512	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C513	1570-00104-272	Cap,Cp,.1uF,10%,X7R,25V,0603
C514	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C515	1570-03102-271	Cap,CP,1000pf,10%,X7R,10V,0402
C516	1552-60463-125	Cap,TN,SMD,22UF,20V,10
C517	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C518	1570-03102-271	Cap,CP,1000pf,10%,X7R,10V,0402
C519	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C520	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C521	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C522	1570-00105-777	Cp,Cap,1uF,X5R,10%,10V,0603
C523	1570-03102-271	Cap,CP,1000pf,10%,X7R,10V,0402
C524	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C525	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C526	1570-03102-271	Cap,CP,1000pf,10%,X7R,10V,0402
C530	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C531	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C532	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C534	1570-00104-272	Cap,Cp,.1uF,10%,X7R,25V,0603

Item Reference Number	Part Number	Description
C535	1513-20012-054	Cap,E,1000UF,+/-20%,25V,85D,10X20mm
C536	1553-50237-780	Cap,Cp,.1UF,5%,X7R,50V,1206,
C538	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C540	1570-03102-271	Cap,CP,1000pf,10%,X7R,10V,0402
C541	1570-00103-273	Cap,CP,10nF,10%,X7R,50V,0603,
C542	1570-03102-271	Cap,CP,1000pf,10%,X7R,10V,0402
C549	1570-03103-261	Cap,Cp,.01uF,5%,X7R,16V,0402
C550	1570-03103-261	Cap,Cp,.01uF,5%,X7R,16V,0402
C551	1570-03103-261	Cap,Cp,.01uF,5%,X7R,16V,0402
C601	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C602	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C603	1570-02225-271	Cap,CP,2.2uF,X7R,10%,16V,1206
C604	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C605	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C606	1570-01105-271	Cap,CP,1uF,X7R,10%,16V,0805
C607	1570-00103-273	Cap,CP,10nF,10%,X7R,50V,0603,
C608	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C609	1570-01105-271	Cap,CP,1uF,X7R,10%,16V,0805
C610	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C611	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C612	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C613	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C614	1570-03150-163	Cap,CP,15pF,NPO,5%,50V,0402
C615	1570-02106-778	Cap,CP,10uF,X5R,10%,1206
C616	1570-00103-273	Cap,CP,10nF,10%,X7R,50V,0603,
C617	1570-03150-163	Cap,CP,15pF,NPO,5%,50V,0402
C618	1570-02106-778	Cap,CP,10uF,X5R,10%,1206
C619	1570-03470-163	Cap,Cp,47pF,NPO,5%,50V,0402
C620	1570-03470-163	Cap,Cp,47pF,NPO,5%,50V,0402
C621	1570-03470-163	Cap,Cp,47pF,NPO,5%,50V,0402
C622	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C623	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C624	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C625	1572-00224-913	Cap,Cp,0.22uF, Film,5%,50V

Item Reference Number	Part Number	Description
C626	1572-00105-734	Cap,Cp,1.0uF,Film,20%,16V,1210
C627	1570-00104-272	Cap,Cp,.1uF,10%,X7R,25V,0603
C628	1570-00223-273	Cap,Cp,.022uF,X7R,10%,50V,0603
C629	1570-00223-273	Cap,Cp,.022uF,X7R,10%,50V,0603
C630	1570-00103-273	Cap,CP,10nF,10%,X7R,50V,0603,
C631	1570-03509-113	Cap,Cp,5pF,NPO,+/-0.25pF,50V,0402
C632	1570-00103-273	Cap,CP,10nF,10%,X7R,50V,0603,
C633	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C634	1570-01105-271	Cap,CP,1uF,X7R,10%,16V,0805
C635	1570-01105-271	Cap,CP,1uF,X7R,10%,16V,0805
C636	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C637	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C638	1570-01105-271	Cap,CP,1uF,X7R,10%,16V,0805
C639	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C640	1570-01105-271	Cap,CP,1uF,X7R,10%,16V,0805
C641	1570-00103-273	Cap,CP,10nF,10%,X7R,50V,0603,
C642	1570-02106-778	Cap,CP,10uF,X5R,10%,1206
C643	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C701	1570-05106-788	Cap,Cp,10uF,X5R,+/-20%,6.3V,0805
C702	1570-03103-261	Cap,Cp,.01uF,5%,X7R,16V,0402
C703	1570-03103-261	Cap,Cp,.01uF,5%,X7R,16V,0402
C704	1552-60463-162	Cap,Tant,10uF,+/-20%,6.3V,2012
C705	1570-00104-261	Cap,Cp,0.1UF,5%,X7R,16V,0603
C706	1570-00104-261	Cap,Cp,0.1UF,5%,X7R,16V,0603
C707	1552-60463-162	Cap,Tant,10uF,+/-20%,6.3V,2012
C708	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C709	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C710	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C711	1570-05105-781	Cap,Cp,1uF,X5R,+/-20%,16V,0805
C712	1570-00104-261	Cap,Cp,0.1UF,5%,X7R,16V,0603
C713	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C714	1570-03102-271	Cap,CP,1000pf,10%,X7R,10V,0402
C715	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C716	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402

Item Reference Number	Part Number	Description
C717	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C718	1570-03103-261	Cap,Cp,.01uF,5%,X7R,16V,0402
C719	1570-03103-261	Cap,Cp,.01uF,5%,X7R,16V,0402
C720	1570-03103-261	Cap,Cp,.01uF,5%,X7R,16V,0402
C721	1570-03103-261	Cap,Cp,.01uF,5%,X7R,16V,0402
C722	1570-03103-261	Cap,Cp,.01uF,5%,X7R,16V,0402
C723	1570-03103-261	Cap,Cp,.01uF,5%,X7R,16V,0402
C724	1570-03103-261	Cap,Cp,.01uF,5%,X7R,16V,0402
C725	1570-03103-261	Cap,Cp,.01uF,5%,X7R,16V,0402
C726	1570-03103-261	Cap,Cp,.01uF,5%,X7R,16V,0402
C727	1570-03103-261	Cap,Cp,.01uF,5%,X7R,16V,0402
C728	1570-03103-261	Cap,Cp,.01uF,5%,X7R,16V,0402
C729	1570-03103-261	Cap,Cp,.01uF,5%,X7R,16V,0402
C730	1570-03103-261	Cap,Cp,.01uF,5%,X7R,16V,0402
C731	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C732	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C733	1570-05105-781	Cap,Cp,1uF,X5R,+/-20%,16V,0805
C734	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C735	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C736	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C737	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C738	1570-03220-163	Cap,Cp,22pF,5%,NPO,50V,0402
C739	1570-03220-163	Cap,Cp,22pF,5%,NPO,50V,0402
C740	1570-03220-163	Cap,Cp,22pF,5%,NPO,50V,0402
C741	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C742	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C743	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C744	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C745	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C746	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C747	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C748	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C749	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C750	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402

Item Reference Number	Part Number	Description
C751	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C752	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C753	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C755	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C756	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C757	1570-03103-261	Cap,Cp,.01uF,5%,X7R,16V,0402
C758	1570-03103-261	Cap,Cp,.01uF,5%,X7R,16V,0402
C759	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C760	1570-03103-261	Cap,Cp,.01uF,5%,X7R,16V,0402
C761	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
CR501	4824-30599-702	DI,SCHOTTKY,MBR0520LT1,SOD-123
CR502	4824-30599-702	DI,SCHOTTKY,MBR0520LT1,SOD-123
CR702	4824-30541-202	Di,Switching,1SS355
CR703	4824-30599-702	DI,SCHOTTKY,MBR0520LT1,SOD-123
FB501	2503-20022-200	Ferrite,Bead,Surfc,Mt
FB502	2503-02121-505	Bead,Fer.,120_OHMS@100MHz,200ma,0402
FB503	2503-02121-505	Bead,Fer.,120_OHMS@100MHz,200ma,0402
FB504	2503-02121-505	Bead,Fer.,120_OHMS@100MHz,200ma,0402
FB505	2503-02121-505	Bead,Fer.,120_OHMS@100MHz,200ma,0402
FB506	2503-02102-410	Bead,Ferrite,1K_Ohm,100MHz,0.1A,0603
FB507	2503-02102-410	Bead,Ferrite,1K_Ohm,100MHz,0.1A,0603
FB508	2503-02121-505	Bead,Fer.,120_OHMS@100MHz,200ma,0402
FB509	2503-02121-505	Bead,Fer.,120_OHMS@100MHz,200ma,0402
FB510	2503-02121-505	Bead,Fer.,120_OHMS@100MHz,200ma,0402
FB511	2503-02121-505	Bead,Fer.,120_OHMS@100MHz,200ma,0402
FB512	2503-20022-200	Ferrite,Bead,Surfc,Mt
FB514	2503-02121-505	Bead,Fer.,120_OHMS@100MHz,200ma,0402
FB601	2503-02121-505	Bead,Fer.,120_OHMS@100MHz,200ma,0402
FB602	2503-02121-505	Bead,Fer.,120_OHMS@100MHz,200ma,0402
FB603	2503-02121-505	Bead,Fer.,120_OHMS@100MHz,200ma,0402
FB702	2503-02121-505	Bead,Fer.,120_OHMS@100MHz,200ma,0402
FB703	2503-02121-505	Bead,Fer.,120_OHMS@100MHz,200ma,0402

Item Reference Number	Part Number	Description
FB704	2503-02121-505	Bead,Fer.,120_OHMS@100MHz,200ma,0402
FB705	2503-02121-505	Bead,Fer.,120_OHMS@100MHz,200ma,0402
FB706	2503-02121-505	Bead,Fer.,120_OHMS@100MHz,200ma,0402
J505	2105-20017-608	Conn,Box_Strip
J508	2105-20018-112	Conn,Flex_Circuit,12_Cond
J509	2105-20018-012	Conn,Flex,
J661	2108-20017-401	Socket,Mini,Spring,
J662	2108-20017-401	Socket,Mini,Spring,
J663	2108-20017-401	Socket,Mini,Spring,
J664	2108-20017-401	Socket,Mini,Spring,
J665	2108-20017-401	Socket,Mini,Spring,
J666	2108-20017-401	Socket,Mini,Spring,
J672	2108-20017-401	Socket,Mini,Spring,
L501	1812-10014-251	IND,Fxd,Pwr,10 uH,10%,LQH31CN100K01
L701	1812-10014-251	IND,Fxd,Pwr,10 uH,10%,LQH31CN100K01
P501	2105-20017-803	Conn,Straight,Dbl_Row,Hdr
Q501	4823-20025-400	Xstr,PNP,Pwr,MJD210,Smd,
Q502	4823-30680-018	Xstr,NPN,W/Bias,47K,SOT-23
Q503	4823-30680-102	Xstr,Dig,NPN,47K/47K,SC-70
Q505	4823-30680-102	Xstr,Dig,NPN,47K/47K,SC-70
Q506	4823-30680-102	Xstr,Dig,NPN,47K/47K,SC-70
Q507	4823-30680-104	Xstr,Dig,NPN,22K/22K,SC-70
Q602	4823-30741-301	Xstr,PNP,Rf_Sm_Sig,MMBT5087,SOT-23,
Q603	4823-30562-201	Xstr,RF,BFR92A
R501	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R502	4734-02003-311	Res,Cp,200K,1%,1/16W,0402
R503	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R504	4734-01003-311	Res,CP,100K,1%,1/16W,0402
R505	4734-01003-311	Res,CP,100K,1%,1/16W,0402

Item Reference Number	Part Number	Description
R506	4734-01501-311	Res,CP,1.5K,1%,1/16W,0402
R507	4718-50237-354	Res,Cp,4300_Ohm,1/8W,5%,1206,
R508	4734-01009-311	Res,Cp,10_Ohms,1/16W,1%,0402
R509	4728-00309-335	Res,Cp,3_Ohm,1/4W,5%
R510	4734-01373-311	Res,CP,137K,1%,1/16W,0402
R511	4734-01503-311	Res,CP,150K,1%,1/16W,0402
R512	4734-03653-311	Res,Cp,365K,1/16W,1%,0402
R513	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R514	4734-02492-311	Res,Cp,24.9K,1%,1/16W,0402
R515	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R516	4734-01000-311	Res,Cp,100_ohm,1%,1/16W,0402
R518	4734-01003-311	Res,CP,100K,1%,1/16W,0402
R519	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R520	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R521	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R522	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R523	4734-02552-311	Res,Cp,25.5K,1%,1/16W,0402
R524	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R525	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R526	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R527	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R528	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R529	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R530	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R531	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R532	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R534	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R535	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R537	4734-01000-311	Res,Cp,100_ohm,1%,1/16W,0402
R538	4734-01000-311	Res,Cp,100_ohm,1%,1/16W,0402
R539	4734-02492-311	Res,Cp,24.9K,1%,1/16W,0402
R540	4734-01783-311	Res,Cp,178K,1/16W,1%,0402
R543	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R544	4734-02212-311	Res,CP,22.1K,1%,1/16W,0402

Item Reference Number	Part Number	Description
R546	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R548	4734-01002-311	Res,CP,10K,1%,1/16W,0402
R549	4734-01002-311	Res,CP,10K,1%,1/16W,0402
R550	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R551	4734-01003-311	Res,CP,100K,1%,1/16W,0402
R552	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R553	4734-01002-311	Res,CP,10K,1%,1/16W,0402
R554	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R555	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R556	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R557	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R558	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R559	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R560	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R561	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R562	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R563	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R564	4734-00000-008	Res,Cp,0_Ohms(Jumper),1/16W,1A,0402
R565	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R566	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R567	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R568	4734-02491-311	Res,Cp,2.49K,1/16W,1%,0402
R569	4734-01003-311	Res,CP,100K,1%,1/16W,0402
R570	4734-01002-311	Res,CP,10K,1%,1/16W,0402
R571	4734-01002-311	Res,CP,10K,1%,1/16W,0402
R572	4734-01003-311	Res,CP,100K,1%,1/16W,0402
R573	4734-01002-311	Res,CP,10K,1%,1/16W,0402
R574	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R575	4734-01000-311	Res,Cp,100_ohm,1%,1/16W,0402
R577	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R578	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R579	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R580	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R581	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402

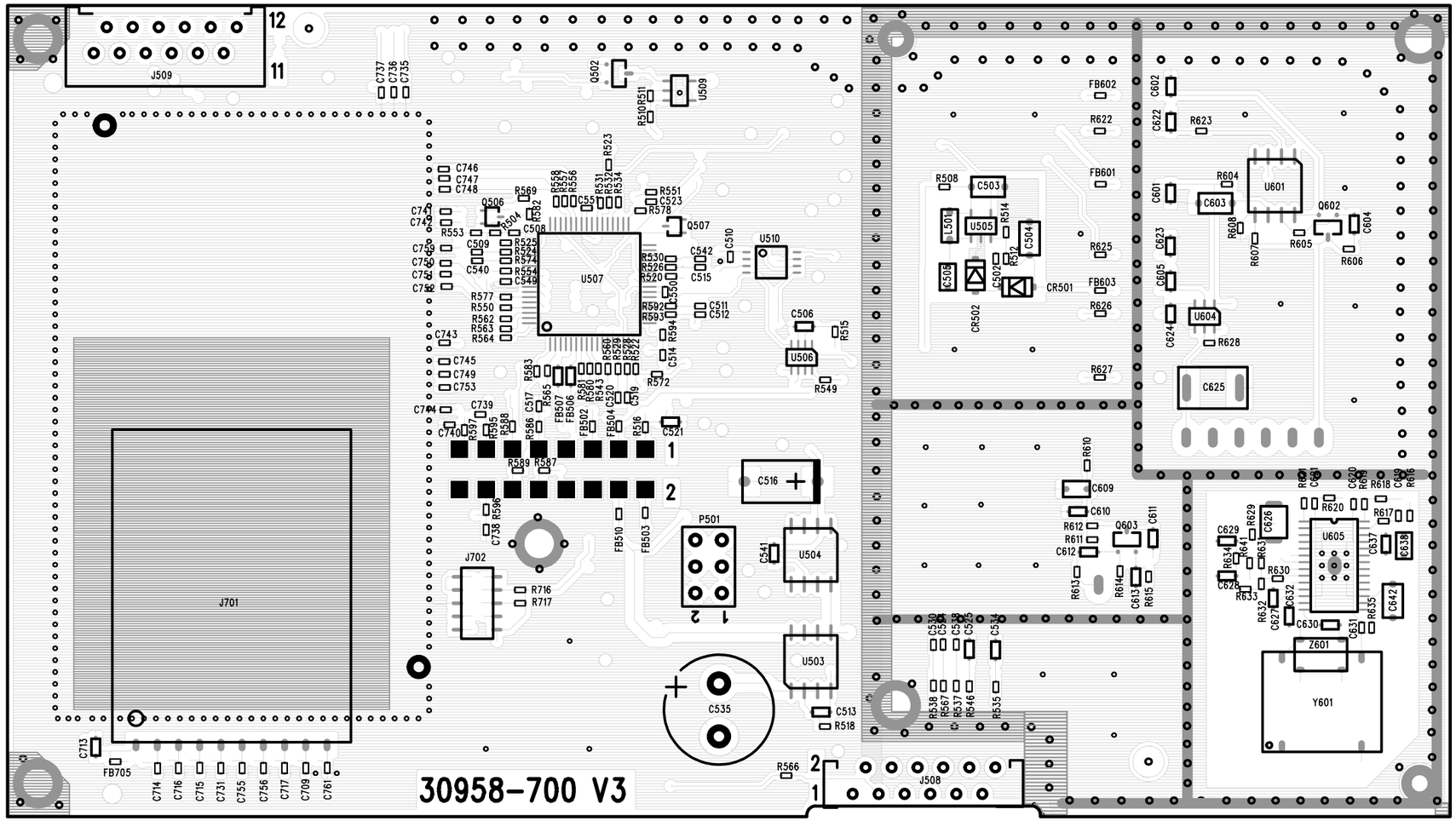
Item Reference Number	Part Number	Description
R582	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R583	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R586	4734-01000-311	Res,Cp,100_ohm,1%,1/16W,0402
R587	4734-01000-311	Res,Cp,100_ohm,1%,1/16W,0402
R588	4734-01000-311	Res,Cp,100_ohm,1%,1/16W,0402
R589	4734-01000-311	Res,Cp,100_ohm,1%,1/16W,0402
R592	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R593	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R594	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R595	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R596	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R597	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R601	4734-04322-311	Res,CP,43.2K,1%,1/16W,0402
R602	4734-03012-311	Res,CP,30.1K,1%,1/16W,0402
R603	4734-08062-311	Res,Cp,80.6K,1%,1/16W,0402
R604	4734-06812-311	Res, Cp, 68.1K, 1%, 1/16W, 0402
R605	4734-03321-311	Res,Cp,3.32 K,1/16W,1%,0402
R606	4734-07501-311	Res,Cp,7.5K,1/16W,1%,0402
R607	4734-01622-311	Res,Cp,16.2K,1%,1/16W,0402
R608	4734-02212-311	Res,CP,22.1K,1%,1/16W,0402
R609	4734-03012-311	Res,CP,30.1K,1%,1/16W,0402
R610	4734-01000-311	Res,Cp,100_ohm,1%,1/16W,0402
R611	4734-01002-311	Res,CP,10K,1%,1/16W,0402
R612	4734-01000-311	Res,Cp,100_ohm,1%,1/16W,0402
R613	4734-02740-311	Res,Cp,274_Ohms,1/16W,1%,0402
R614	4734-03011-311	Res,CP,3.01K,1%,1/16W,0402
R615	4734-04750-311	Res,Cp,475 Ohm,1%,1/16W,0402
R616	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R617	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R618	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R619	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R620	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R621	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R622	4734-02612-311	Res,Cp,26.1K,1/16W,1%,0402

Item Reference Number	Part Number	Description
R623	4734-01002-311	Res,CP,10K,1%,1/16W,0402
R625	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R626	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R627	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R628	4734-01004-311	Res,Cp,1M,1%,1/16W,0402
R629	4734-01004-311	Res,Cp,1M,1%,1/16W,0402
R630	4734-02491-311	Res,Cp,2.49K,1/16W,1%,0402
R631	4734-02000-311	Res,Cp,200_Ohms,1%,1/16W,0402
R632	4734-01000-311	Res,Cp,100_ohm,1%,1/16W,0402
R633	4734-04750-311	Res,Cp,475 Ohm,1%,1/16W,0402
R634	4734-04750-311	Res,Cp,475 Ohm,1%,1/16W,0402
R635	4734-01212-311	Res,Cp,12.1k,1/16W,1%,0402
R636	4734-01009-311	Res,Cp,10_Ohms,1/16W,1%,0402
R637	4734-01009-311	Res,Cp,10_Ohms,1/16W,1%,0402
R638	4734-01009-311	Res,Cp,10_Ohms,1/16W,1%,0402
R639	4734-01009-311	Res,Cp,10_Ohms,1/16W,1%,0402
R640	4734-01009-311	Res,Cp,10_Ohms,1/16W,1%,0402
R641	4734-01004-311	Res,Cp,1M,1%,1/16W,0402
R701	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R703	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R704	4734-02212-311	Res,CP,22.1K,1%,1/16W,0402
R705	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R706	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R707	4734-01000-311	Res,Cp,100_ohm,1%,1/16W,0402
R708	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R709	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R710	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R711	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R712	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R713	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R715	4734-01652-311	Res,CP,16.5K,1%,1/16W,0402,
R716	4734-04751-311	Res,CP,4.75K,1%,1/16W,0402
R717	4734-04751-311	Res,CP,4.75K,1%,1/16W,0402
R718	4734-01912-311	Res,Cp,19.1K,1%,1/16W,0402

Item Reference Number	Part Number	Description
R719	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R720	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R721	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R722	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R723	4734-01003-311	Res,CP,100K,1%,1/16W,0402
R724	4734-01002-311	Res,CP,10K,1%,1/16W,0402
R725	4734-01009-311	Res,Cp,10_Ohms,1/16W,1%,0402
R726	4734-01003-311	Res,CP,100K,1%,1/16W,0402
R727	4734-01009-311	Res,Cp,10_Ohms,1/16W,1%,0402
R729	4734-01003-311	Res,CP,100K,1%,1/16W,0402
R730	4734-01000-311	Res,Cp,100_ohm,1%,1/16W,0402
R731	4734-03920-311	Res,CP,392_OHMS,1%,1/16W,0402
R732	4734-02009-311	Res,Cp,20_Ohms,1/16W,1%,0402
R733	4734-02009-311	Res,Cp,20_Ohms,1/16W,1%,0402
R734	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R735	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R736	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R737	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R738	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R739	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R740	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R741	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R742	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R743	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R744	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R745	4734-00000-008	Res,Cp,0_Ohms(Jumper),1/16W,1A,0402
R746	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R747	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R748	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R749	4734-01001-311	Res,CP,1.00K,1%,1/16W,0402
R750	4734-01003-311	Res,CP,100K,1%,1/16W,0402
SH1	2508-30945-600	SHIELD,OPTION BOARD

Item Reference Number	Part Number	Description
U501	3134-20040-900	Ic,DMX,HCF4053,SO16,
U503	3134-30950-501	IC,P-Ch,30V,PwrTrench,FDS6679,S0-8
U504	3134-30670-403	IC,RGA,LP2951CM,SO8,
U505	3134-30950-402	IC,DC/DC,Invert,LT1617ES5-1,SOT23-5
U506	3134-20083-004	IC,Dig,Pot,AD5160BRJ10,SOT-23
U507	3134-20082-401	IC,MCU,MC9S08GB60FU,QFB
U508	3134-30670-413	IC,OPA,LM2904D,SO8
U509	3134-30911-003	IC,OP_AMP,R/R,LT1783CS5,SOT-23
U510	3134-30940-810	IC,DUAL,10-Bit,DAC,MAX5721EUA,uSOP-8
U511	3134-30747-819	IC,EEPROM,24LC256-I/SN,256K,2.5V,SO8 (*)
U601	3134-30670-409	IC,OPA,LMC662CM,SO8,
U602	3134-30950-304	IC,REG,ADJ,LDO,100ma,TPS79101DBV,SOT-23
U603	3134-30950-304	IC,REG,ADJ,LDO,100ma,TPS79101DBV,SOT-23
U604	3134-30906-202	IC,SW,SPST,MAX4520EUT-T,SOT23-6
U605	3134-30577-404	IC,Freq_Syn,CX72301-11,TSSOP
U701	3134-30949-710	IC,DSP,TMS320VC5410APGE,LQFP-144
U702	3134-30949-800	IC, 4MB Flash Mem, 3V, AM29LV400BT-120EI
U703	3134-30949-900	IC,Quad 2-Input,Pos-NAND,SN74ALVC00PWR
U704	3134-30950-000	IC, 16 Bit A/D & 16 Bit D/A, AD73311LARU
U705	3134-30950-400	IC,Sw,Reg,3.3V,LT1616ES6,SOT-23
U706	3134-30950-305	IC,REG,1.5V,150mA,LDO,TPS77115DGK,MSOP-8
U707	3134-30960-100	IC,Uni-Direct,Xlator,FXLP34P5X,SC70-5
U708	3134-30950-600	IC,T_Logic,ULP,D_Flp/Flp,NC7SP74K8X,US8
U709	3134-30950-601	IC,T_Logic,ULP,NC7SP17P5X,SC-70
U710	3134-30950-601	IC,T_Logic,ULP,NC7SP17P5X,SC-70
Y601	2390-30957-102	TCXO, 10.000MHz, SMD
Y701	2390-30957-100	TCXO, 19.6608 MHz, SMD

REV	VER	REVISION				
C	3	DRAWN BY: J.E. Villanueva	CHK BY: -	APPRD. BY: C. McClanahan	EN: FR	DATE: 07-28-05
		FORMAL RELEASE				



TOP SIDE

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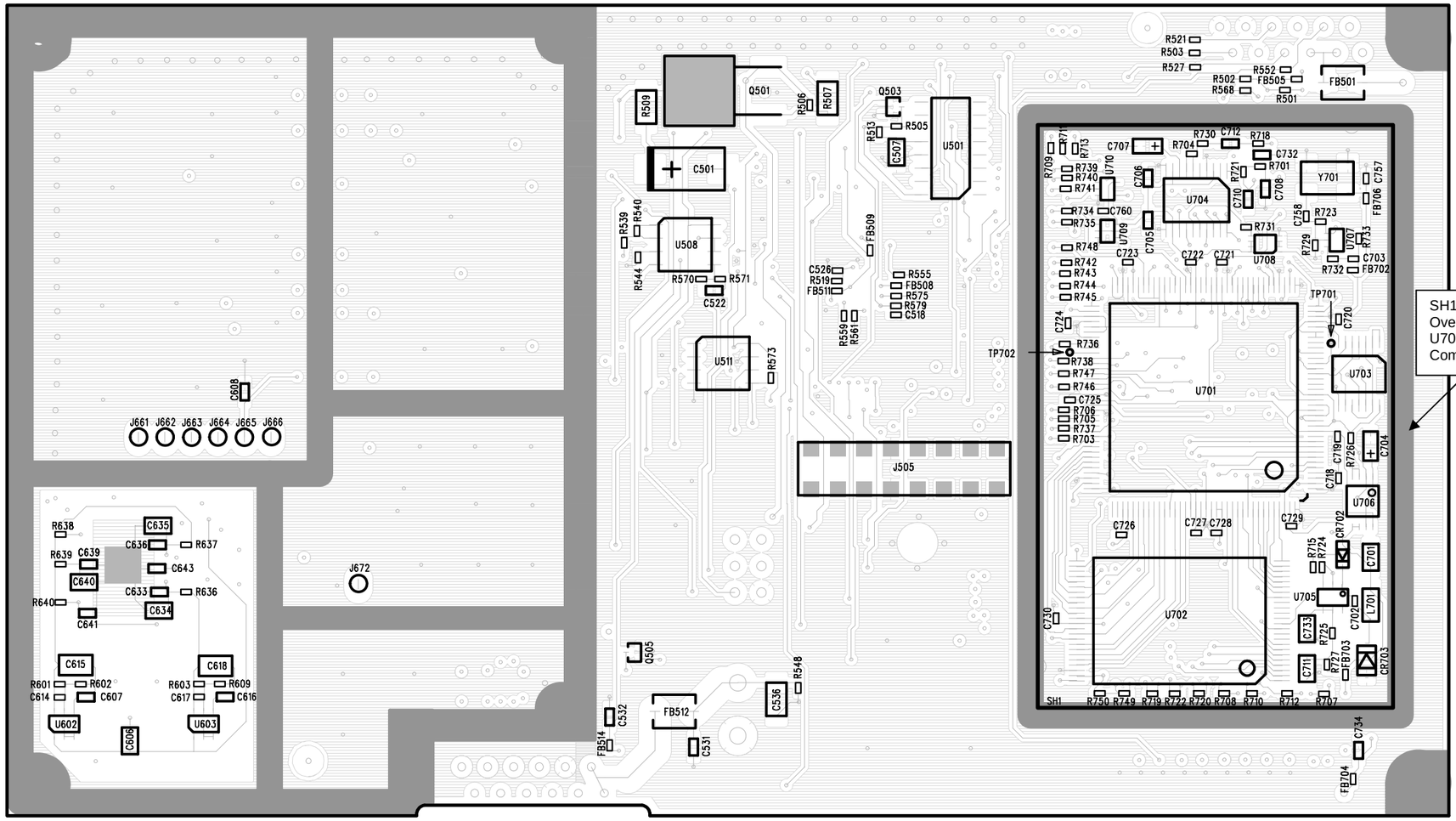
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND INCLUDE APPLIED FINISH TOLERANCES	TITLE: PARTS PLACEMENT, SYSTEMS BOARD, DMH		
TOLERANCES: 2 PLACE DIM. .02 — 3 PLACE DIM. .005 — ANGLES 1/2 — SCREW THREADS-AMERICAN NATIONAL CLASS CLASS-	SIZE: B	DRAWING NO.: 8888-30958-700	
THIRD ANGLE PROJECTION	SCALE: 2.500	REFERENCE: DMH	SHEET: 1 OF 2

REV	VER	REVISION				
C	3	DRAWN BY: J.E. Villanueva	CHK BY: -	APPRD. BY: C. McClanahan	EN: FR	DATE: 07-28-05
		FORMAL RELEASE				



BOTTOM SIDE

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND INCLUDE APPLIED FINISH TOLERANCES

TOLERANCES:
2 PLACE DIM. .02 3 PLACE DIM. .005 ANGLES 1/2
SCREW THREADS-AMERICAN NATIONAL CLASS
CLASS-

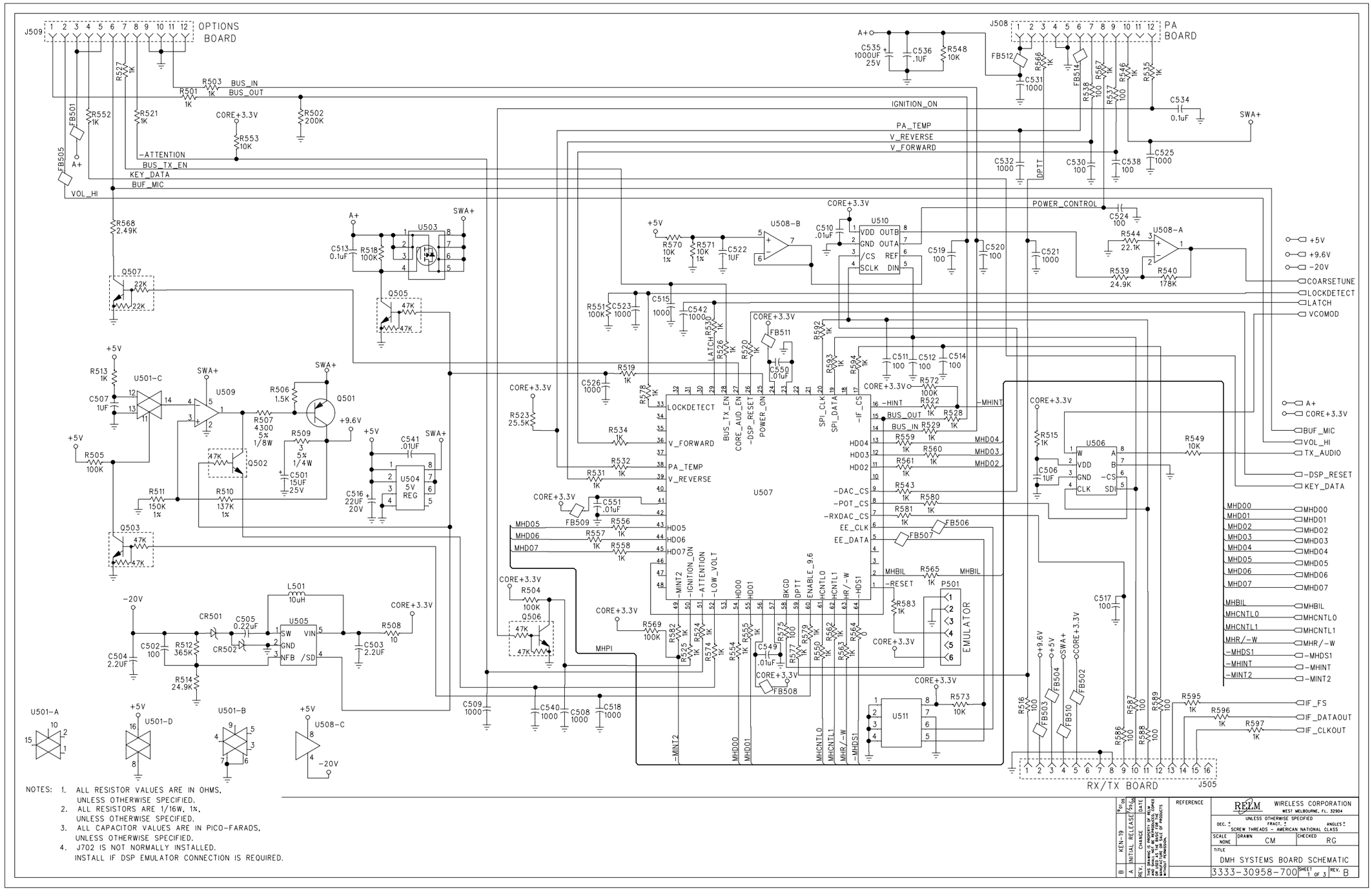
THIRD ANGLE PROJECTION

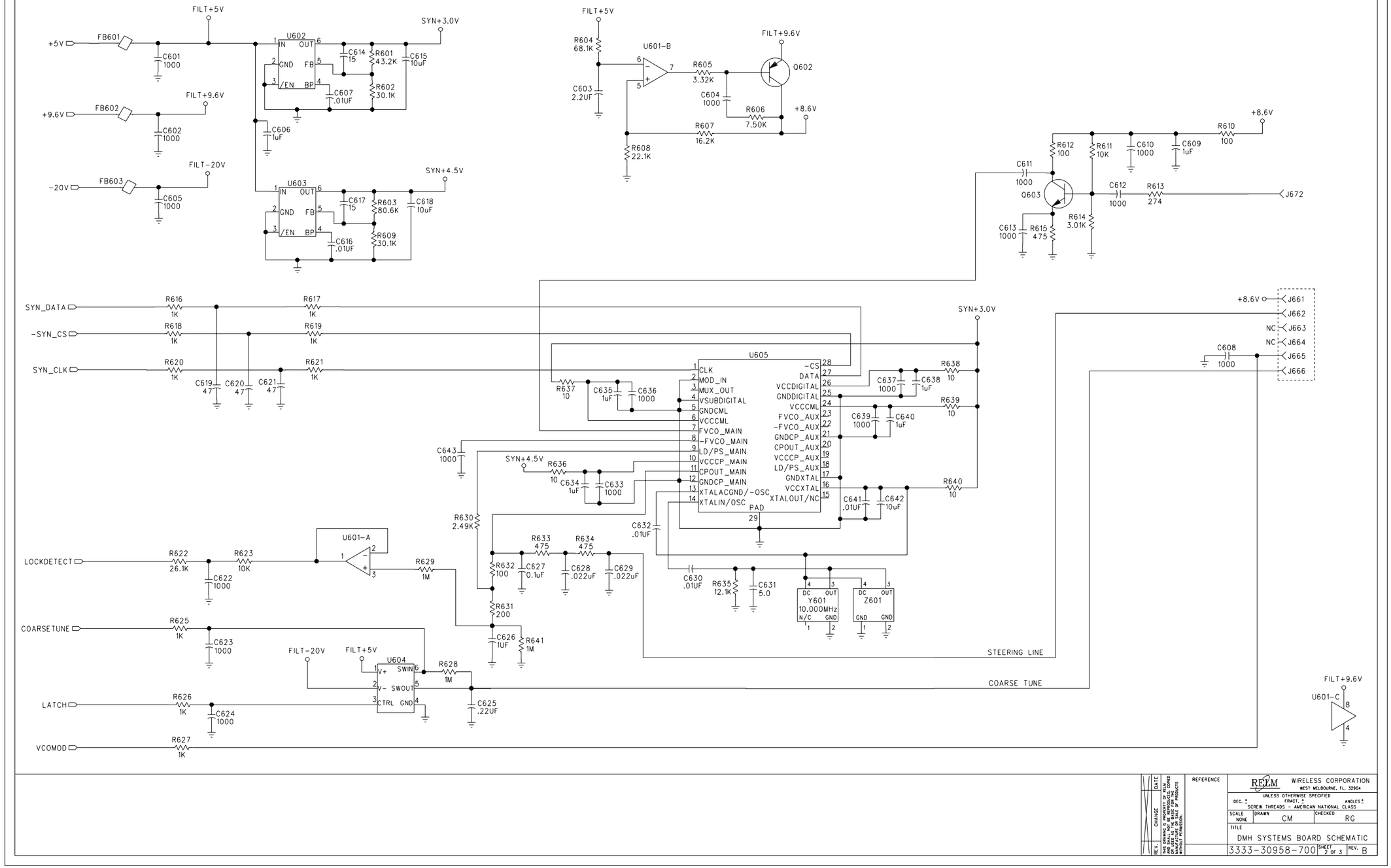
RELM COMMUNICATIONS INC.
WEST MELBOURNE, FL. 32904

TITLE: PARTS PLACEMENT, SYSTEMS BOARD, DMH

SIZE: B | DRAWING NO.: 8888-30958-700

SCALE: 2.500 | REFERENCE: DMH | SHEET: 2 OF 2


OPTIONS BOARD
PA BOARD
RX/TX BOARD
EMULATOR
U507
U508-A
U508-B
U508-C
U509
U510
U511
U501-A
U501-B
U501-C
U501-D
U503
U504 5V REG
U505
U506
Q501
Q502
Q503
Q505
Q506
Q507
BUS_IN
BUS_OUT
-ATTENTION
BUS_TX_EN
KEY_DATA
BUF_MIC
VOL_HI
IGNITION_ON
PA_TEMP
V_REVERSE
V_FORWARD
POWER_CONTROL
LOCKDETECT
CORE_AUD_EN
-DSP_RESET
POWER_ON
SPI_CLK
SPI_DATA
-IF_CS
-HINT
BUS_OUT
BUS_IN
-DAC_CS
-POT_CS
-RXDAC_CS
EE_CLK
EE_DATA
-RESET
-MINT2
-IGNITION_ON
-ATTENTION
LOW_VOLT
ENABLE_9.6
LATCH
MHPI
BKGD
DPTT
+5V
+9.6V
-20V
SWA+
CORE+3.3V
COARSETUNE
LOCKDETECT
LATCH
VCOMOD
TX_AUDIO
KEY_DATA
IF_FS
IF_DATAOUT
IF_CLKOUT
NOTES: 1. ALL RESISTOR VALUES ARE IN OHMS, UNLESS OTHERWISE SPECIFIED.
2. ALL RESISTORS ARE 1/16W, 1%, UNLESS OTHERWISE SPECIFIED.
3. ALL CAPACITOR VALUES ARE IN PICO-FARADS, UNLESS OTHERWISE SPECIFIED.
4. J702 IS NOT NORMALLY INSTALLED. INSTALL IF DSP EMULATOR CONNECTION IS REQUIRED.
REFERENCE
RELM WIRELESS CORPORATION
WEST MELBOURNE, FL. 32904
UNLESS OTHERWISE SPECIFIED
SCREW THREADS - AMERICAN NATIONAL CLASS
SCALE NONE
DRAWN CM
CHECKED RG
TITLE
DMH SYSTEMS BOARD SCHEMATIC
3333-30958-700
SHEET 1 OF 3
REV. B
B KEN-19 9/05
A INITIAL RELEASE 2/16/05


FILT+5V
+5V
FB601
C601 1000
U602
IN OUT
GND FB
/EN BP
C614 15
R601 43.2K
C615 10uF
SYN+3.0V
C607 .01UF
R602 30.1K
C606 1uF
FILT+9.6V
+9.6V
FB602
C602 1000
FILT-20V
-20V
FB603
C605 1000
U603
C617 15
R603 80.6K
C618 10uF
SYN+4.5V
C616 .01UF
R609 30.1K
R604 68.1K
U601-B
C603 2.2UF
R605 3.32K
Q602
C604 1000
R606 7.50K
+8.6V
R607 16.2K
R608 22.1K
R612 100
R611 10K
C610 1000
C609 1uF
R610 100
C611 1000
Q603
C612 1000
R613 274
J672
C613 1000
R615 475
R614 3.01K
SYN_DATA
-SYN_CS
SYN_CLK
R616 1K
R617 1K
R618 1K
R619 1K
R620 1K
R621 1K
C619 47
C620 47
C621 47
U605
CLK
MOD_IN
MUX_OUT
VSUBDIGITAL
GNDCML
VCCCML
FVCO_MAIN
-FVCO_MAIN
LD/PS_MAIN
VCCCP_MAIN
CPOUT_MAIN
GNDCP_MAIN
XTALACGND/-OSC
XTALIN/OSC
-CS
DATA
VCCDIGITAL
GNDDIGITAL
VCCCML
FVCO_AUX
-FVCO_AUX
GNDCP_AUX
CPOUT_AUX
VCCCP_AUX
LD/PS_AUX
GNDXTAL
VCCXTAL
XTALOUT/NC
PAD 29
R637 10
C635 1uF
C636 1000
C637 1000
C638 1uF
R638 10
C639 1000
C640 1uF
R639 10
C643 1000
SYN+4.5V
R636 10
C634 1uF
C633 1000
R640 10
C641 .01UF
C642 10uF
R630 2.49K
C632 .01UF
R633 475
R634 475
U601-A
LOCKDETECT
R622 26.1K
R623 10K
C622 1000
R629 1M
R632 100
C627 0.1uF
C628 .022uF
C629 .022uF
C630 .01UF
R635 12.1K
C631 5.0
R631 200
Y601 10.000MHz
Z601
DC OUT
N/C GND
GND GND
C626 1UF
R641 1M
COARSETUNE
R625 1K
C623 1000
FILT-20V
FILT+5V
U604
V+ SWIN
V- SWOUT
CTRL GND
R628 1M
C625 .22UF
STEERING LINE
COARSE TUNE
LATCH
R626 1K
C624 1000
VCOMOD
R627 1K
+8.6V
J661
J662
NC J663
NC J664
J665
J666
C608 1000
FILT+9.6V
U601-C
8
4
REFERENCE
REV.
CHANGE
DATE
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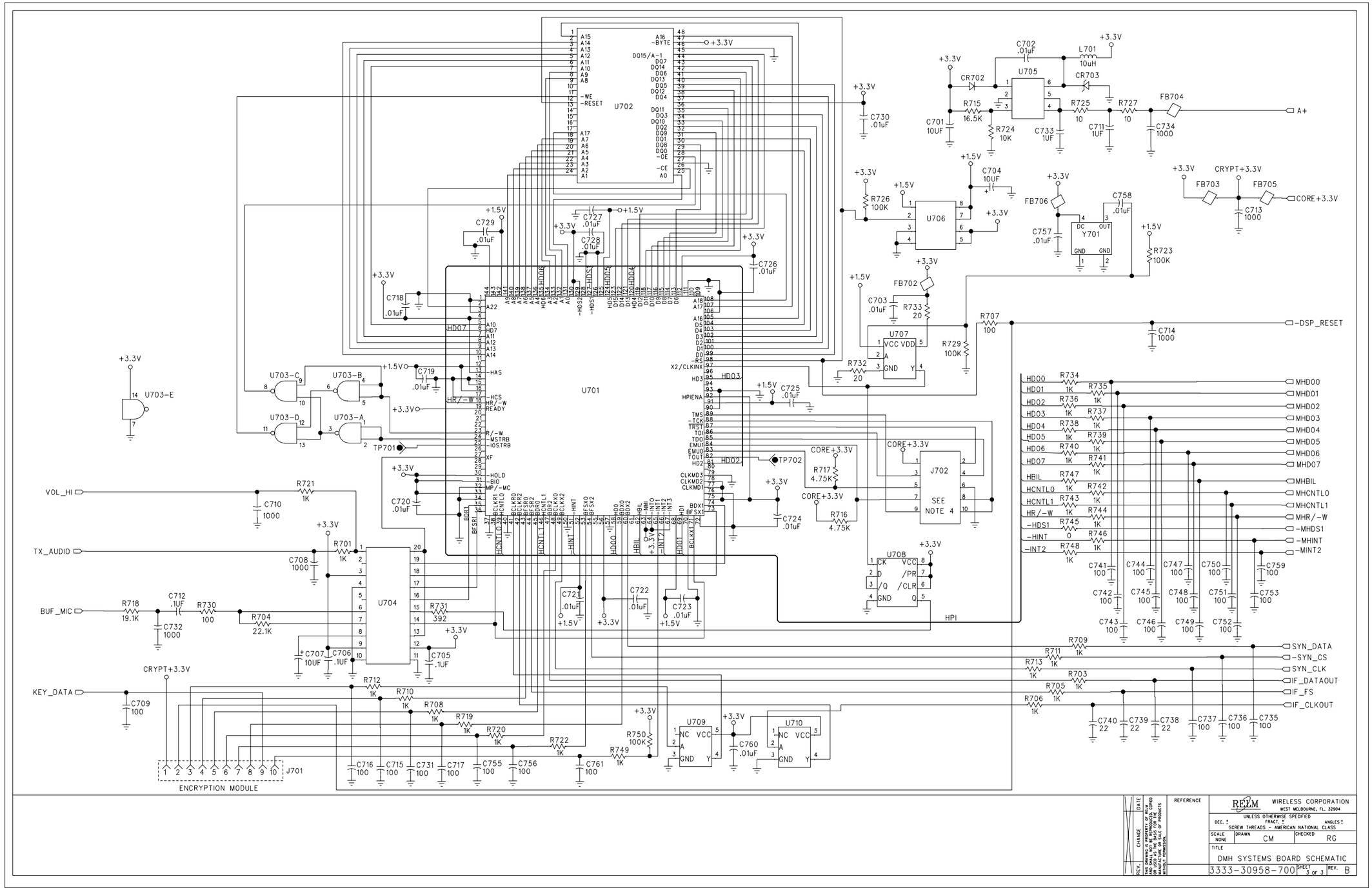
DEC. ± FRACT. ± ANGLES ±
SCREW THREADS - AMERICAN NATIONAL CLASS
SCALE NONE
DRAWN CM
CHECKED RG
TITLE
DMH SYSTEMS BOARD SCHEMATIC
3333-30958-700
SHEET 2 OF 3
REV. B

[Sheet 2]


U702
U701
U704
U705
U706
U707
U708
U709
U710
Y701
J702
SEE NOTE 4
J701
ENCRYPTION MODULE
U703-A
U703-B
U703-C
U703-D
U703-E
TP701
TP702
HPI
VOL_HI
TX_AUDIO
BUF_MIC
KEY_DATA
A+
CORE+3.3V
CRYPT+3.3V
-DSP_RESET
MHD00
MHD01
MHD02
MHD03
MHD04
MHD05
MHD06
MHD07
MHBIL
MHCNTL0
MHCNTL1
MHR/-W
-MHDS1
-MHINT
-MINT2
SYN_DATA
-SYN_CS
SYN_CLK
IF_DATAOUT
IF_FS
IF_CLKOUT
REFERENCE
REVISIONS
DESCRIPTION
CHANGE
DATE
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UNLESS OTHERWISE SPECIFIED
DEC. ± FRACT. ± ANGLES ±
SCREW THREADS - AMERICAN NATIONAL CLASS
SCALE NONE
DRAWN CM
CHECKED RG
TITLE
DMH SYSTEMS BOARD SCHEMATIC
3333-30958-700
SHEET 3 OF 3
REV. B

Table 6-12. Replacement Parts, VCO Board (309-647, Rev. A)

Item Reference Number	Part Number	Description
ITM 1	1700-30964-700	PCB,DMH VCO BD.
B1	2503-20022-300	Ferrite,Bead,Surfc,Mt
C1	1553-50313-582	Cap,Cp,1000PF,5%,NPO,50V,0805,
C2	1553-50313-582	Cap,Cp,1000PF,5%,NPO,50V,0805,
C3	1553-50237-768	Cap,Cp,39PF,5%,NPO,50V,0805,
C4	1553-50313-582	Cap,Cp,1000PF,5%,NPO,50V,0805,
C5	1553-50237-780	Cap,Cp,.1UF,5%,X7R,50V,1206,
C6	1553-50313-582	Cap,Cp,1000PF,5%,NPO,50V,0805,
C7	1552-60463-133	Cap,Cp_Tant,1.5UF,10%,25V,125D,3528,
C9	1553-50313-551	Cap,Cp,8.2PF,+-.25PF,NPO,50V,0805,
C10	1553-50313-582	Cap,Cp,1000PF,5%,NPO,50V,0805,
C11	1553-50237-780	Cap,Cp,.1UF,5%,X7R,50V,1206,
C17	1553-50313-582	Cap,Cp,1000PF,5%,NPO,50V,0805,
C19	1553-50313-565	Cap,Cp,.5PF,+-.1PF,NPO,50V,0805,
C21	1553-50313-582	Cap,Cp,1000PF,5%,NPO,50V,0805,
C22	1553-50313-582	Cap,Cp,1000PF,5%,NPO,50V,0805,
C27	1553-50313-552	Cap,Cp,10PF,5%,NPO,50V,0805,
C30	1553-50313-582	Cap,Cp,1000PF,5%,NPO,50V,0805,
C31	1553-50313-582	Cap,Cp,1000PF,5%,NPO,50V,0805,
CR1	4824-30572-501	Di,Var,BB439
CR2	4824-20021-900	Di,Shottky,MA4CS102,SOT-23,
CR3	4824-20021-100	Di,Var,MMBV105,SOT-23,
CR10	4824-30572-501	Di,Var,BB439
CR11	4824-30572-501	Di,Var,BB439
CR12	4824-30572-501	Di,Var,BB439
L1	1808-20013-628	Ind,Fxd_Coil,1000NH@25MHz,Q=38,SMD
L2	1808-20013-618	Ind,Fxd_Coil,270NH@25MHz,Q=28,SMD
L3	1808-20013-628	Ind,Fxd_Coil,1000NH@25MHz,Q=38,SMD

Item Reference Number	Part Number	Description
L5	1808-20013-628	Ind,Fxd_Coil,1000NH@25MHz,Q=38,SMD
L7	1808-20013-649	Ind,Fxd_Coil,68NH@50MHz,Q=50,SMD
P61	2107-50231-702	Term,Contact,Pin,W/Star
P62	2107-50231-702	Term,Contact,Pin,W/Star
P63	2107-50231-702	Term,Contact,Pin,W/Star
P65	2107-50231-702	Term,Contact,Pin,W/Star
P66	2107-50231-702	Term,Contact,Pin,W/Star
P71	2107-50231-704	Term,Contact,Pin,W/Star,
P72	2107-50231-702	Term,Contact,Pin,W/Star
Q1	4823-50483-200	Xstr,NJFET,Rf_Sm_Sig,MMBFU310,SOT-23,
Q4	4823-20020-300	Xstr,NPN,Sm_Sig,MMBTA14,SOT23,
Q6	4823-20020-600	Trans, MOSFET,BF994S,SOT 143
R1	4732-01503-511	Res,Cp,150K,1%,1/16W,0603
R2	4732-02742-511	Res,Cp,27.4K,1%,1/16W,0603
R3	4732-02009-511	Res,Cp,20_Ohms,1%,1/16W,0603
R5	4732-01822-511	Res,Cp,18.2K,1%,1/16W,0603
R6	4732-01002-511	Res,Cp,10K,1%,1/16W,0603
R10	4732-01820-511	Res,Cp,182_Ohm,1%,1/16W,0603
R13	4732-01002-511	Res,Cp,10K,1%,1/16W,0603
R15	4732-02009-511	Res,Cp,20_Ohms,1%,1/16W,0603
R16	4732-01009-511	Res,Cp,10_Ohms,1%,1/16W,0603
R18	4732-02740-511	Res,Cp,274_Ohm,1%,1/16W,0603
R19	4732-04753-511	Res,Cp,475K,1%,1/16W,0603
R20	4732-01000-511	Res,Cp,100_Ohm,1%,1/16W,0603
T1	5602-20024-200	Transfmr,Toriodal,

REV	VER	REVISION				
A	1	DRAWN BY: J.E. Villanueva	CHK BY: -	APPRD. BY: E. McGlanahan	EN: FR	DATE: 07-08-05
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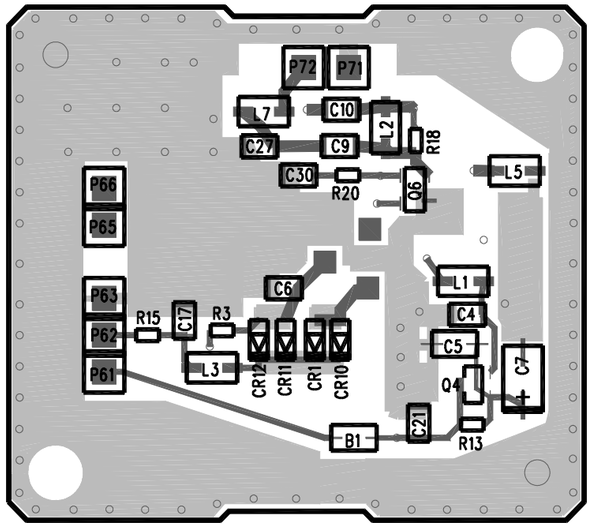
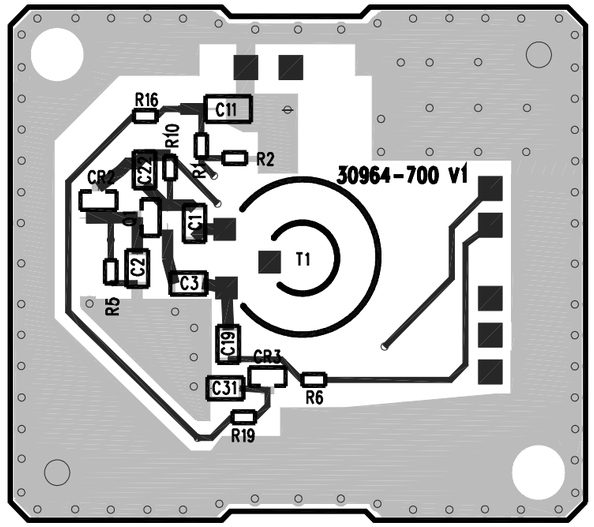


TOP SIDE



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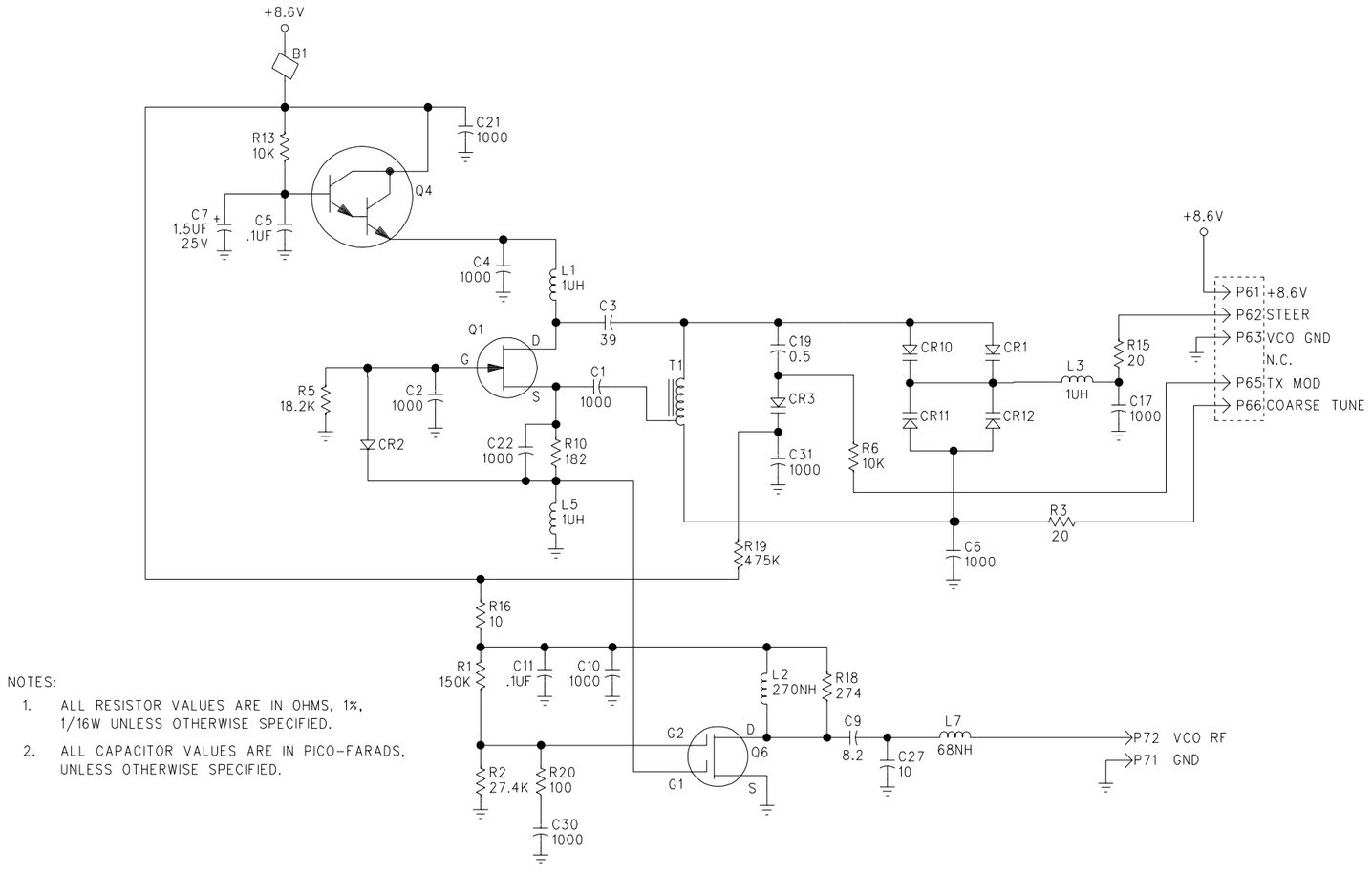
TOLERANCES
2 PLACE DIM. ±.02
3 PLACE DIM. ±.005
ANGLES ±1/2°
SCREW THREADS-AMERICAN NATIONAL CLASS CLASS-

THIRD ANGLE PROJECTION

RELM COMMUNICATIONS INC.
WEST MELBOURNE, FL. 32904

TITLE: PARTS PLACEMENT, VCO BOARD, DMH

SIZE: B
DRAWING NO.: 8888-30964-700
SCALE: 3.000
REFERENCE: DMH
SHEET: 1 OF 1



NOTES:

1. ALL RESISTOR VALUES ARE IN OHMS, 1%, 1/16W UNLESS OTHERWISE SPECIFIED.
2. ALL CAPACITOR VALUES ARE IN PICO-FARADS, UNLESS OTHERWISE SPECIFIED.

REV.	CHANGE	DATE
A	Initial Release	7/6/05

REFERENCE

RELM COMMUNICATIONS INC.
WEST MELBOURNE, FL. 32904

UNLESS OTHERWISE SPECIFIED
DEC. ± FRACT. ± ANGLES ±
SCREW THREADS – AMERICAN NATIONAL CLASS

SCALE	DRAWN	CHECKED
	CM	RG

TITLE: DMH VCO BOARD SCHEMATIC

DRAWING NO. 3333-30964-700 REV. A

Table 6-13. Replacement Parts, Interface Board – Remote Mount

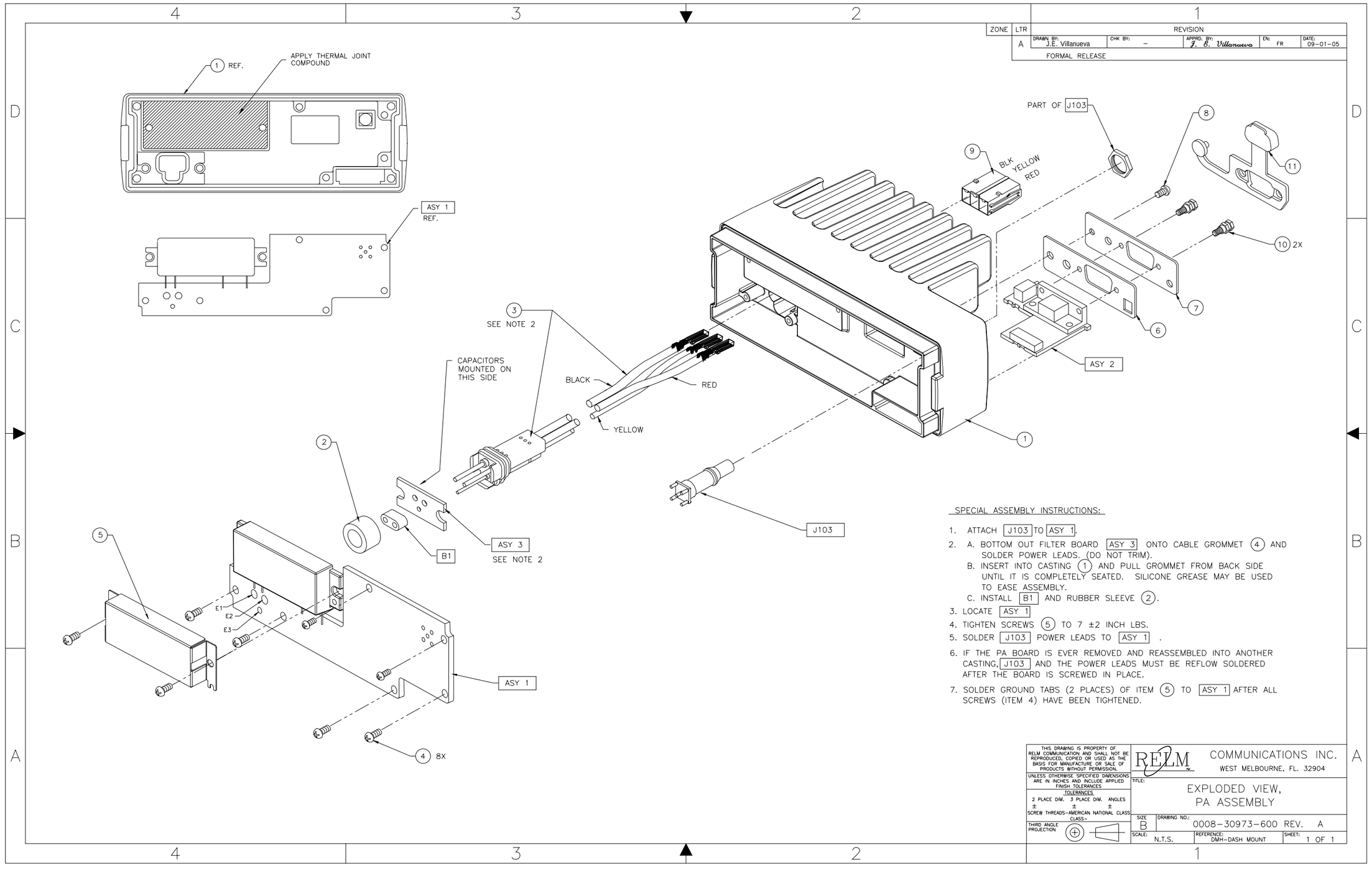
RESERVED

RESERVED

RESERVED

Table 6-14. Replacement Parts, High Level PA Assembly

Item Reference Number	Part Number	Description
Assy 1	7031-30963-900	DMH_PA_Bd_Auto-SMD/Pts
Assy 2	7031-20099-300	EMH5990A_Accessory_Auto-SMD/Pts
Assy 3	7031-30965-500	DMH_FILTER_Bd_Auto-SMD/Pts
ITM 1	5400-30967-201	HEAT SINK, DMH-PA, 50 WATT
ITM 2	1417-20019-200	Cushion,EMV,
ITM 3	6006-30970-801	Cable Assy, Power Connect, DMH
ITM 4	2807-30298-014	Scr,SIMMS,4-40,X5/16,P,PH,ST,CAD/ZN (QTY 8)
ITM 5	2508-30969-201	Shield, PA Module
ITM 6	2512-40003-001	Gasket, Accessory
ITM 7	2506-40001-901	Cover, Accessory
ITM 8	2808-20019-500	Scr,MS,4-40,X1/4,P,PH,SS,BLKCH
ITM 9	2109-30972-200	HOUSING, RECEPTACLE, 3 POS, JST VLR-03V
ITM 10	2813-20016-801	Standoff,Access Cover (QTY 2)
ITM 11	2512-40004-100	Rubber_Seal/Boot
B1	2502-20022-400	Ferrite,Core
J103	2105-30969-700	Conn.,Ant-Recept.,Radiall R123.426.057


ZONE LTR REVISION
A DRAWN BY: J.E. Villanueva CHK BY: – APPRD. BY: J. E. Villanueva EN: FR DATE: 09-01-05
FORMAL RELEASE
1 REF.
APPLY THERMAL JOINT COMPOUND
ASY 1
REF.
PART OF J103
8
9
BLK
YELLOW
RED
11
10 2X
7
6
ASY 2
3
SEE NOTE 2
CAPACITORS MOUNTED ON THIS SIDE
BLACK
RED
YELLOW
2
B1
ASY 3
SEE NOTE 2
1
J103
5
E1
E2
E3
ASY 1
4 8X
SPECIAL ASSEMBLY INSTRUCTIONS:
1. ATTACH J103 TO ASY 1.
2. A. BOTTOM OUT FILTER BOARD ASY 3 ONTO CABLE GROMMET (4) AND SOLDER POWER LEADS. (DO NOT TRIM).
B. INSERT INTO CASTING (1) AND PULL GROMMET FROM BACK SIDE UNTIL IT IS COMPLETELY SEATED. SILICONE GREASE MAY BE USED TO EASE ASSEMBLY.
C. INSTALL B1 AND RUBBER SLEEVE (2).
3. LOCATE ASY 1
4. TIGHTEN SCREWS (5) TO 7 ±2 INCH LBS.
5. SOLDER J103 POWER LEADS TO ASY 1 .
6. IF THE PA BOARD IS EVER REMOVED AND REASSEMBLED INTO ANOTHER CASTING, J103 AND THE POWER LEADS MUST BE REFLOW SOLDERED AFTER THE BOARD IS SCREWED IN PLACE.
7. SOLDER GROUND TABS (2 PLACES) OF ITEM (5) TO ASY 1 AFTER ALL SCREWS (ITEM 4) HAVE BEEN TIGHTENED.
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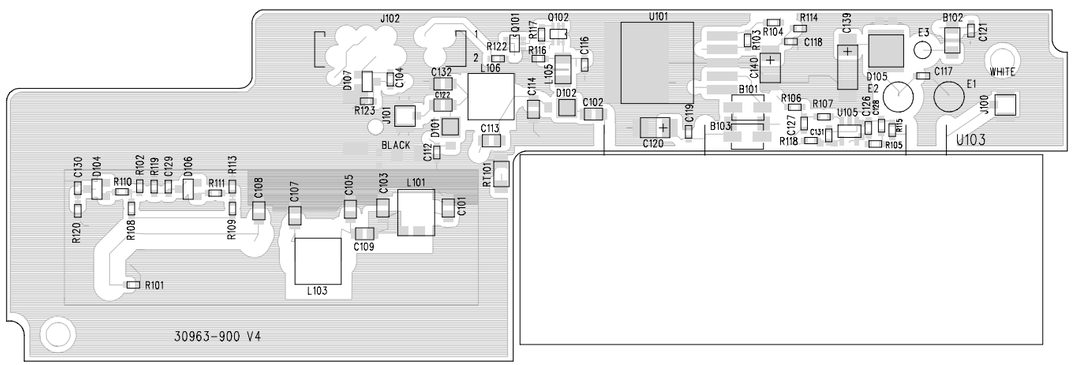
TOLERANCES
2 PLACE DIM. ± 3 PLACE DIM. ± ANGLES ±
SCREW THREADS-AMERICAN NATIONAL CLASS CLASS-
THIRD ANGLE PROJECTION
RELM COMMUNICATIONS INC.
WEST MELBOURNE, FL. 32904
TITLE: EXPLODED VIEW, PA ASSEMBLY
SIZE B DRAWING NO.: 0008-30973-600 REV. A
SCALE: N.T.S. REFERENCE: DMH-DASH MOUNT SHEET: 1 OF 1

Table 6-15 Replacement Parts, PA Board (309-639, D)

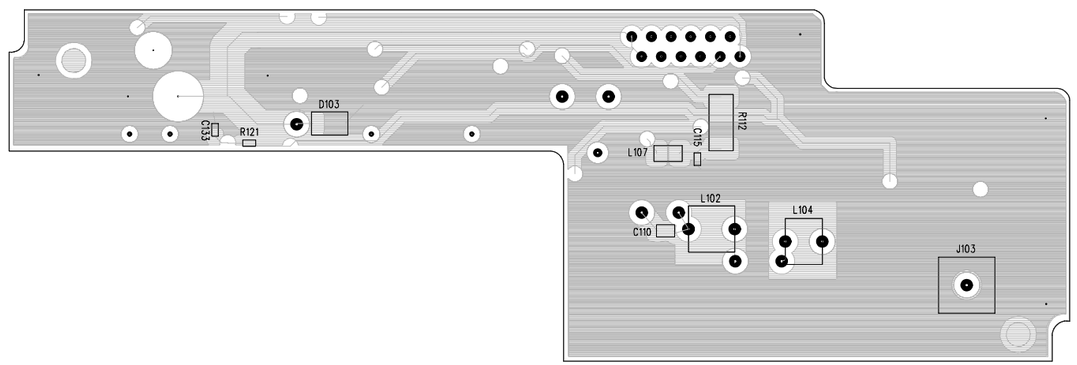
Item Reference Number	Part Number	Description
ITM1	1700-30963-900	PCB,DMH PA BD
ITM 2	2508-30969-201	Shield, PA Module
B101	2503-20022-200	Ferrite,Bead,Surfc,Mt
B102	2503-20022-300	Ferrite,Bead,Surfc,Mt
B103	2503-20022-200	Ferrite,Bead,Surfc,Mt
C101	1575-02100-171	Cap,Cp,10pF,5%,NPO,250V,0805
C102	1575-02390-171	Cap,Cp,39pF,5%, NPO, 250V,0805
C103	1575-02270-171	Cap,Cp,27pF,5%,NPO,250V,0805
C104	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C105	1575-02300-171	Cap,Cp,30pF,5%,NPO,250V,0805
C107	1575-02240-171	Cap,Cp,24pF,5%,NPO,250V,0805
C108	1575-02479-131	Cap,Cp,4.7pF,+/-.25pF,NPO,250V,0805
C109	1575-02569-131	Cp,Cap,5.6pF,+/-.25pF,NPO,250V,0805
C110	1575-02829-131	Cap,Cp,8.2pF,+/-.25pF,NPO,250V,0805
C112	1570-00391-163	Cp,Cap,390PF,NPO,5%,0603
C113	1575-02470-171	Cap,Cp,47pF,5%,NPO,250V,0805
C114	1575-02209-121	Cap,Cp,2.0pF,+/-0.1pF,NPO,250V,0805
C115	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C116	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C117	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C118	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C119	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C120	1552-60463-156	Cap,Tant,4.7uF,10%,25V,3528
C121	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C122	1575-02560-171	Cp,Cap,56pF,5%,NPO,250V,0805
C126	1570-00224-277	Cap,CP,0.22uF,10%,X7R,10V,0603,
C127	1570-00223-273	Cap,Cp,.022uF,X7R,10%,50V,0603
C128	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C129	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C130	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,

Item Reference Number	Part Number	Description
C131	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C132	1575-02159-121	Cp,Cap,1.5pF,+/-.1pF,NPO,250V,0805
C133	1570-00102-163	Cap,CP,1.0nF,5%,COG,50V,0603,
C139	1552-60463-169	Cap,Tant,15uF,10%,25V,6032
C140	1552-60463-167	Cap,Tant,10uF,10%,20V,3528
D101	4824-20047-301	Di,Pin,UPP1001,SMD
D102	4824-20047-301	Di,Pin,UPP1001,SMD
D103	4828-30513-103	Di,Transient_V_Supp,SMAJ17CA
D104	4824-20042-300	Di,Schottky-Dual,BAS70,SOT-23,
D105	4824-30971-800	Di,5A_Hi_Volt,Barrier Rect,PDS5100H,SMD
D106	4824-20042-300	Di,Schottky-Dual,BAS70,SOT-23,
D107	4824-20042-300	Di,Schottky-Dual,BAS70,SOT-23,
J100	2101-50522-100	CONN,RECEPTACLE,SMT
J101	2101-50522-100	CONN,RECEPTACLE,SMT
J102	2105-20018-112	Conn,Flex_Circuit,12_Cond
J103	2105-30969-700	Conn.,Ant-Recept.,Radiall 04-0400-212
L101	1801-20023-508	IND,FXD_AW_COIL,4T,18GA,0.148,LFT_HND
L102	1801-20023-505	IND,FXD_AW_COIL,5T,18GA,0.139D,LFT_HND
L103	1801-20023-503	IND,FXD_AW_COIL,5T,18GA,0.155D,LFT_HND
L104	1801-20023-507	IND,FXD_AW_COIL,4T,18GA,0.146D,LFT_HND
L105	1808-20013-628	Ind,Fxd_Coil,1000NH@25MHz,Q=38,SMD
L106	1801-20023-503	IND,FXD_AW_COIL,5T,18GA,0.155D,LFT_HND
L107	1808-20013-628	Ind,Fxd_Coil,1000NH@25MHz,Q=38,SMD
Q101	3134-30950-521	IC,N-CH,PwrTrench,FDG329N,SC70-6
Q102	3134-30950-520	IC,N-CH,PwrTrench,FDG328P,SC70-6
R101	4732-03013-511	Res,Cp,301K,1%,1/16W,0603
R102	4732-07509-511	Res,Cp,75_Ohms,1%,1/16W,0603
R103	4732-03092-511	Res,Cp,30.9K,1%,1/16W,0603
R104	4732-01002-511	Res,Cp,10K,1%,1/16W,0603

Item Reference Number	Part Number	Description
R105	4732-00120-531	Res,Cp,12_Ohm,5%,1/16W,0603
R106	4732-01132-511	Res,Cp,11.3K,1%,1/16W,0603
R107	4732-08872-511	Res,Cp,88.7K,1%,1/16W,0603
R108	4732-00000-008	Res,CP,0_Ohm,
R109	4732-00000-008	Res,CP,0_Ohm,
R110	4732-01210-511	Res,Cp,121_Ohms,1%,1/16W,0603
R111	4732-01210-511	Res,Cp,121_Ohms,1%,1/16W,0603
R112	4730-00430-337	Res,Cp,43_Ohm,5%,1W,2512
R113	4732-07509-511	Res,Cp,75_Ohms,1%,1/16W,0603
R114	4732-01001-511	Res,Cp,1K,1%,1/16W,0603
R115	4732-00101-531	Res,Cp,100,5%,1/16W,0603,
R116	4732-01002-511	Res,Cp,10K,1%,1/16W,0603
R117	4732-03013-511	Res,Cp,301K,1%,1/16W,0603
R118	4732-01003-511	Res,Cp,100K,1%,1/16W,0603
R119	4732-02002--511	Res,Cp,20K,1%,1/16W,0603
R120	4732-01003-511	Res,Cp,100K,1%,1/16W,0603
R121	4732-01004-511	Res,Cp,1.0M,1%,1/16W,0603
R122	4732-01002-511	Res,Cp,10K,1%,1/16W,0603
R123	4732-02002-511	Res,Cp,20K,1%,1/16W,0603
RT101	5302-30958-201	Thermistor, NTC -4.4%, 5%,SMD 1206
U101	3134-30950-301	IC,REG,ADJ,LDO,3A,MIC29302BU
U103	3132-30595-003	IC,RFA,S-AV32
U105	3134-30911-003	IC,OP_AMP,R/R,LT1783CS5,SOT-23



TOP SIDE



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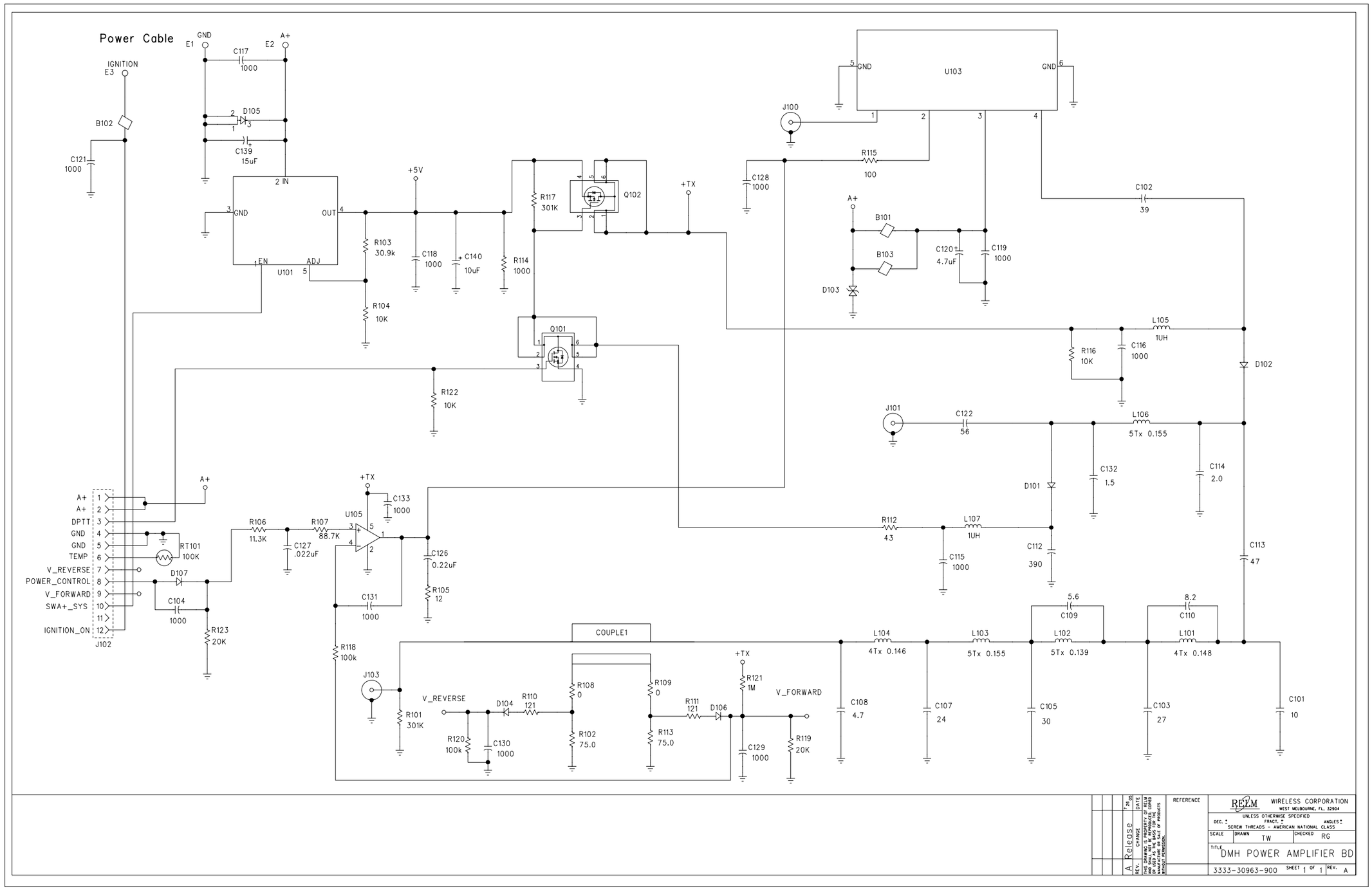
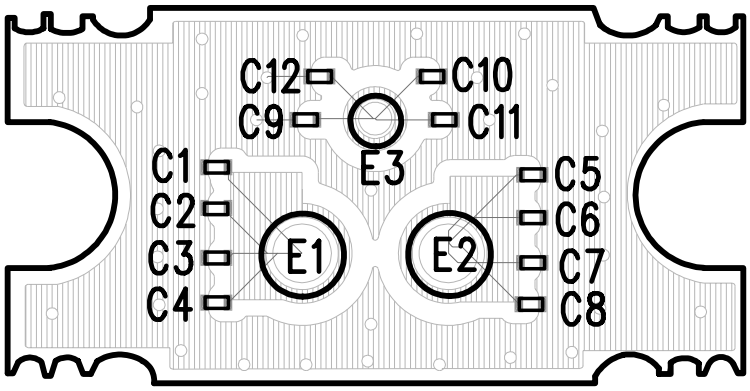


Figure 6-26 PA Board Schematic

Table 6-16 Replacement Parts, Filter Assembly (309-655, Rev. A)

Item Reference Number	Part Number	Description
ITM 1	1700-30965-500	PCB,DMH FILTER BD.
C1	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C2	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C3	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C4	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C5	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C6	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C7	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C8	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C9	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C10	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C11	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402
C12	1570-03101-163	Cap,Cp,100PF,NPO,5%,50V,0402

REV	VER	REVISION				
A	1	DRAWN BY: J.E. Villanueva	CHK BY: -	APPRD. BY: T. Wilkey	EN: FR	DATE: 08-03-05
FORMAL RELEASE						



TOP SIDE

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND INCLUDE APPLIED FINISH TOLERANCES.

TOLERANCES:
2 PLACE DIM. 3 PLACE DIM. ANGLES

SCREW THREADS-AMERICAN NATIONAL CLASS CLASS-

THIRD ANGLE PROJECTION

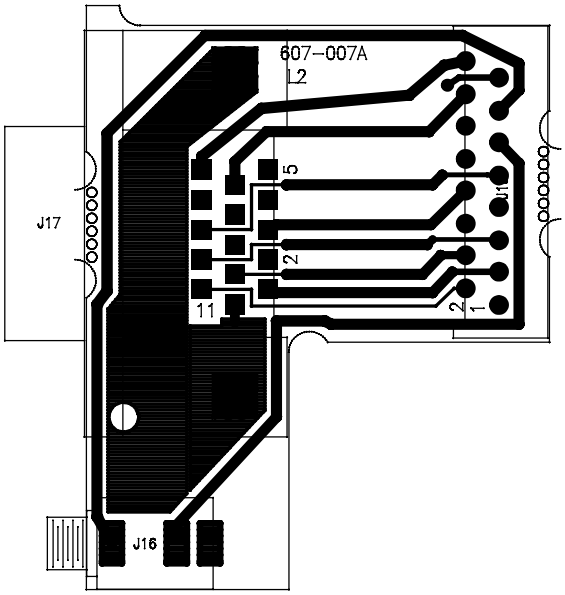
RELM COMMUNICATIONS INC.
WEST MELBOURNE, FL. 32904

TITLE: PARTS PLACEMENT, FILTER BD, DMH

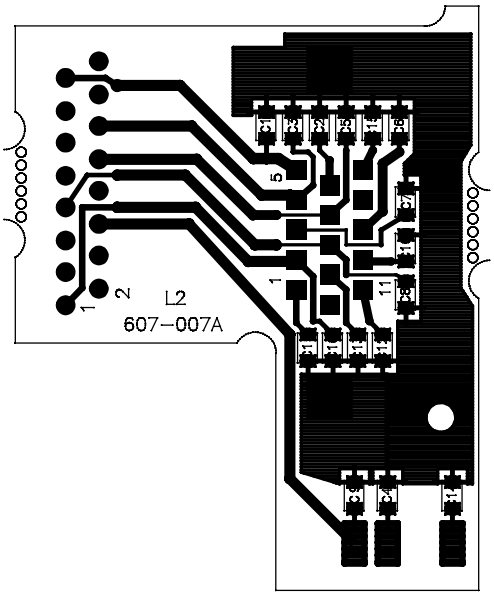
SIZE	DRAWING NO.:	
A	8888-30965-500	
SCALE: NTS	REFERENCE: DMH	SHEET: 1 OF 1

Table 6-17 Replacement Parts, Accessory Board – Dash Mount

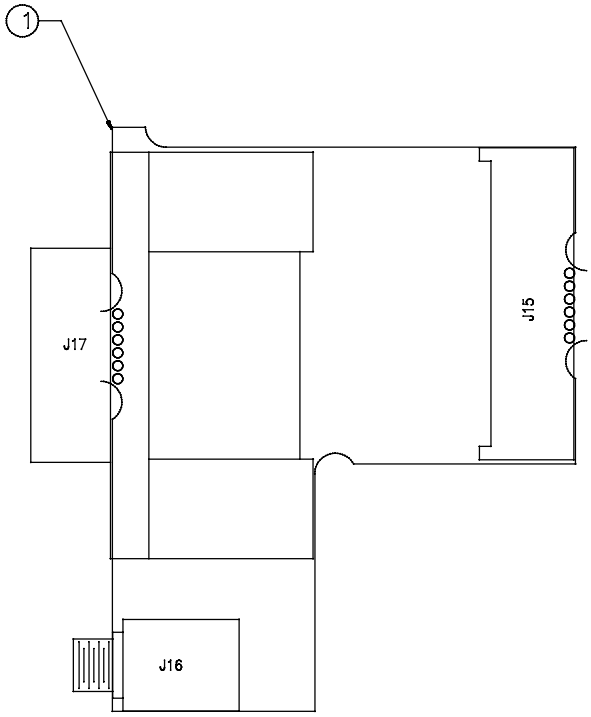
Item Reference Number	Part Number	Description
ITM 1	1700-60700-700	Bd,Pc,Accy,EMH
C1	1553-50313-531	Cap,Cp,100PF,5%,NPO,50V,0805
C2	1553-50313-531	Cap,Cp,100PF,5%,NPO,50V,0805
C3	1553-50313-531	Cap,Cp,100PF,5%,NPO,50V,0805
C4	1553-50313-531	Cap,Cp,100PF,5%,NPO,50V,0805
C5	1553-50313-531	Cap,Cp,100PF,5%,NPO,50V,0805
C6	1553-50313-531	Cap,Cp,100PF,5%,NPO,50V,0805
C7	1553-50313-531	Cap,Cp,100PF,5%,NPO,50V,0805
C8	1553-50313-531	Cap,Cp,100PF,5%,NPO,50V,0805
C9	1553-50313-531	Cap,Cp,100PF,5%,NPO,50V,0805
C10	1553-50313-531	Cap,Cp,100PF,5%,NPO,50V,0805
C11	1553-50313-531	Cap,Cp,100PF,5%,NPO,50V,0805
C12	1553-50313-531	Cap,Cp,100PF,5%,NPO,50V,0805
C13	1553-50313-531	Cap,Cp,100PF,5%,NPO,50V,0805
C14	1553-50313-531	Cap,Cp,100PF,5%,NPO,50V,0805
C15	1553-50313-531	Cap,Cp,100PF,5%,NPO,50V,0805
J15	2105-20018-016	Conn,Flex_Circuit,16 Cond
J16	2101-20018-701	JACK,AUDIO,2.5MM,
J17	2105-20017-500	Conn,Hdr,15_Pos,

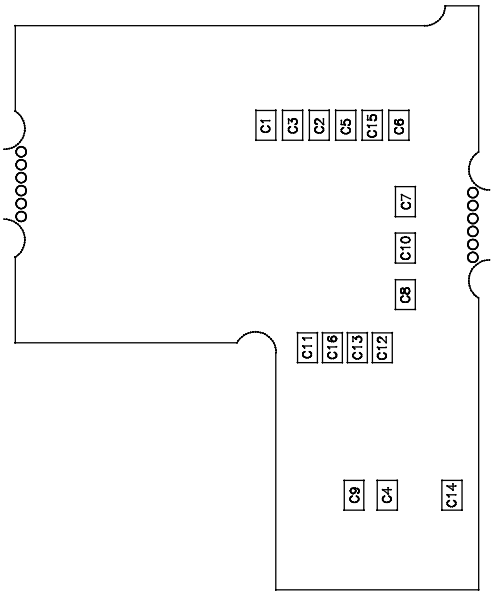


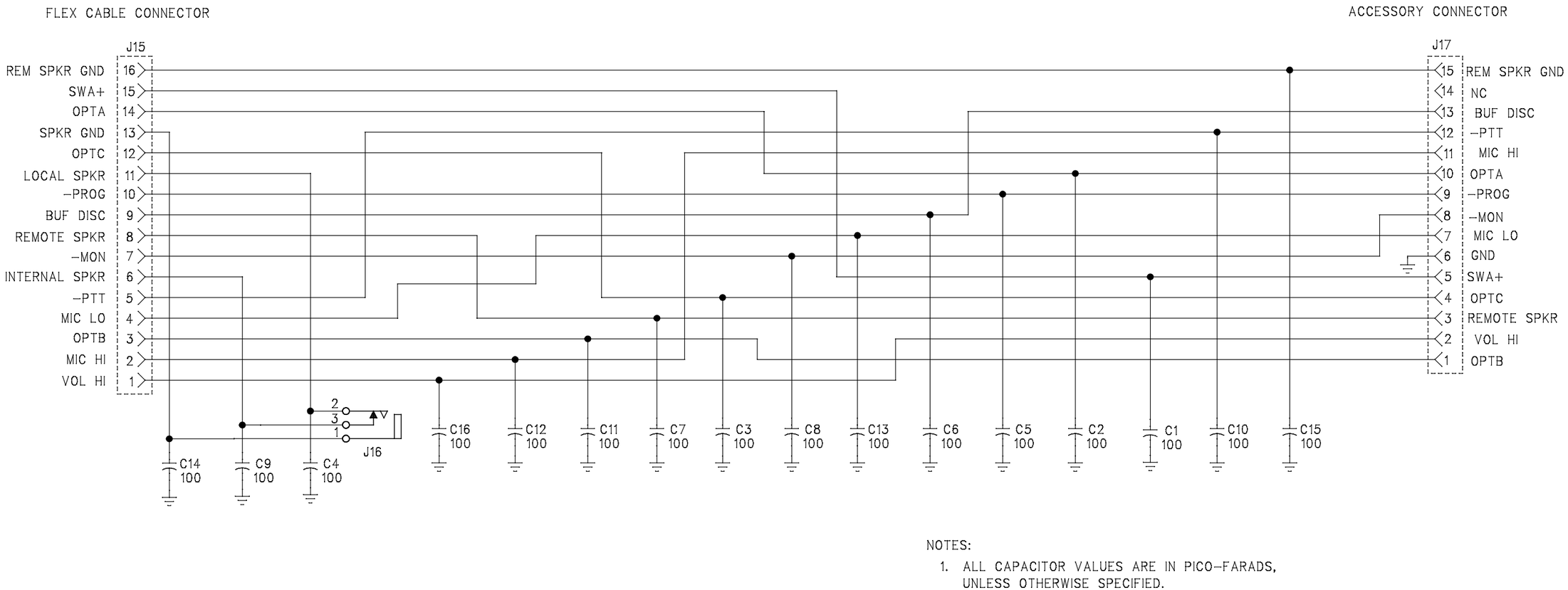
TOP SIDE



BOTTOM SIDE







NOTES:

1. ALL CAPACITOR VALUES ARE IN PICO–FARADS, UNLESS OTHERWISE SPECIFIED.